RE5

SUZUKI

RE5

SERVICE MANUAL

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SUZUKI RE 5

FOREWORD

This Manual provides all servicing information on the SUZUKI RE5 in regard to disassembly, repair, inspection and reassembly of all the components and systems except the rotary engine internals.

For easy reading and for logical division of the subject matter, the text of this Manual is edited according to the scheme of dividing the motorcycle into groups. The contents of each group text are indicated on the first group gage.

Dealt with in this Manual is the RE5 motorcycle in production as of May, 1974. Future changes in design or specifications will be covered in Service Bulletins.

SUZUKI MOTOR CO., LTD.
International Service Dept.

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GENERAL INFORMATION

GROUP 1

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1-1. SPECIFICATIONS

DIMENSIONS AND WEIGHT	
Overall length	2220 mm (87.4 in.)
Overall width	870 mm (34.3 in.)
Overall height	1170 mm (46.1 in.)
Wheelbase	1500 mm (59.1 in.)
Ground clearance	170 mm (6.7 in.)
Dry weight	230 kg (507 lbs)
ENGINE	
Type	NUS-Wankel type rotary piston engine
Number of rotors	1 (one)
Capacity	497 cc (30.3 cu-in.), single chamber
Corrected compression ratio	8.6
Maximum output	62.0 Hp at 6500 rpm (SAE, NET)
Maximum torque	7.60 kg-m (54.9 ft-lb) at 3500 rpm
Carburetor	MIKUNI 18-32 HHD
Air cleaner	Wet polyurethane filter
Starter system	Electric and kick (option)

TRANSMISSION SYSTEM	
Clutch	Wet multi-plate type
Transmission	5-speed constant-mesh type
Gearshift pattern	Left foot return type
Primary reduction	1.652 (38/23)
Final reduction	3.071 (43/14)
Gear ratios: Low	2.846 (37/13)
2nd	1.736 (33/19)
3rd	1.363 (30/22)
4th	1.125 (27/24)
Top	0.923 (24/26)
Drive chain	#630, 96 links, endless type
CHASSIS	
Front suspension	Telescopic fork with hydraulic damper
Rear suspension	Swinging arm with hydraulic dampers adjustable in five ways
Front brake	Right-hand operated, hydraulic caliper double-disc brake
Rear brake	Right-foot operated, internally expanding brake
Front tire	3.25 H19-4 PR
Rear tire	4.00 H18-4 PR
Trail	108 mm (4.25 in.)
Caster	63 degrees
Steering angle	40 degrees (right and left)
CAPACITIES	
Fuel tank	17 litres (4.5/3.7 US/Imp. gal.)
Engine oil	2.2 (4.6/3.8 US/Imp. pt.)
Metering oil tank	1.7 litres (3.60/2.99 US/Imp. pt.)
Transmission oil	1.6 litres (3.38/2.84 US/Imp. pt.)
Front fork oil	150 cc (5.3/5.1 US/Imp. oz.)

1-2. RECOMMENDED FUEL, OIL AND ANTI-FREEZE COMPOUND

a. Fuel

In regard to the anti-knocking property of fuel, gasoline with an octane number of **85** to **95** as determined by the **ASTM F-1** (research method) procedure, or an equivalent, is recommended for use in the present engine.

The octane number of a gasoline is the percentage by volume of iso-octane in a mixture of iso-octane and heptane that matches the gasoline under consideration in anti-knock quality. The ASTM provides for several methods, of which F-1 (research method) and F-2 (motor) are more common than the others. The former is less stringent than the latter.

An octane number assigned by the fuel manufacturer to a gasoline of his supply is meaningful only when it is qualified by the type of method.

b. Engine oil and metering oil

Use the SUZUKI R.E. oil. This oil ensures the best engine performance with respect to carbon deposit, pre-ignition, spark plug life and the wear of running parts. Where the SUZUKI R.E. oil is not available, select the oil from the engine oil list furnished by SUZUKI.

The difference between engine oil and metering oil is in name only. Use the same oil for both.

c. Transmission oil

The SUZUKI Transmission Oil is highly recommended. This oil may be substituted by any high-quality multi-grade motor oil with a viscosity rating of SAE 20W or 40.

d. Anti-freeze compound

An anti-freeze compound labeled Golden Cruiser "1200" is available from SUZUKI. Use this compound where freezing temperatures are expected. If this compound is not available, use any highly reputed compound marketed in your area. Be sure to follow the directions given by the manufacturer when preparing an anti-freeze coolant.

1-3. SPARE PARTS ORDERING GUIDE

When replacing parts, be sure to use genuine SUZUKI parts, so that the motorcycle will give maximized performance it is inherently capable of. There are many imitation parts, but such parts do not carry the assurance of the same quality that is given to each genuine SUZUKI parts by high-precision machining or severe quality control.

The SUZUKI Warranty is based in part on the use of genuine SUZUKI parts.

The parts catalog for Model RE5 carries all the information necessary for accurately specifying the replacement parts wanted in the order sheet. Keep the catalog on hand as an integral part of the RE5 service manual, and update it with information which will be furnished from time to time.

1-4. SPECIAL TOOLS

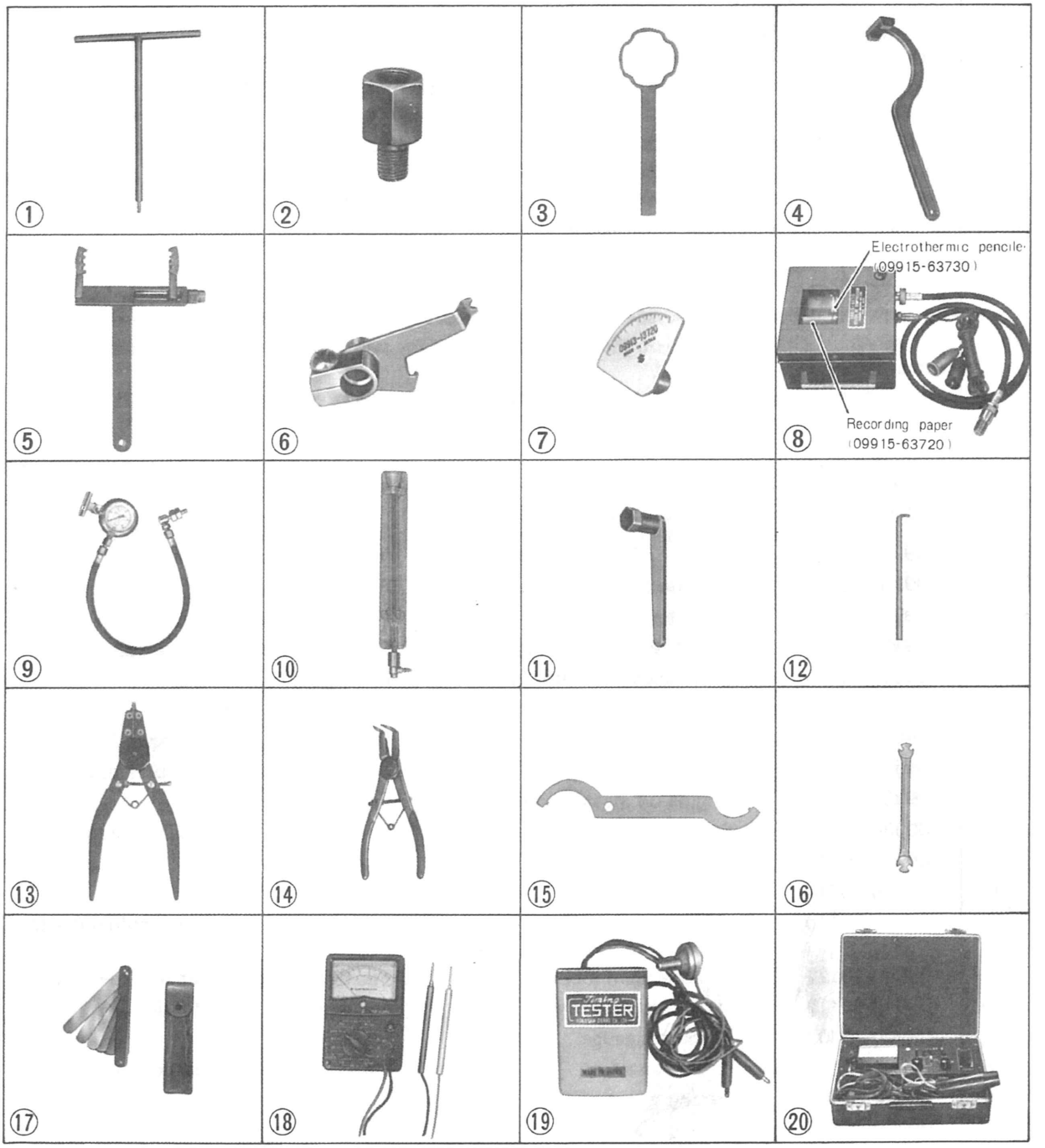
The tools listed hereunder are special ones, designed to facilitate maintenance work—disassembly, reassembly, servicing, checking, etc.—on the RE5, and protect the parts and components of the motorcycle against damage.

Each shop is advised to have these special tools as standard shop equipment. **(Fig. 1-1)**

Asterisk (*) for exclusive use on the RE5

Ref. No.	Tool number	Description	Use
* 1	09911-73730	5-mm "T" Allen wrench	For unscrewing Allen head bolts.
* 2	09930-33710	Alternator rotor puller	For removing alternator rotor.
* 3	09915-43710	Oil filter wrench	For removing oil filter.
5	09920-53710	Clutch sleeve hub holder	For holding clutch sleeve hub.
* 6	09913-13710	Carb. angle indicator "A"	For adjusting carburetor.
* 7	09913-13720	Carb. angle indicator "B"	For adjusting carburetor.
8	09915-63710	Compression tester	For checking compression.
* 9	09915-73710	Oil pressure gauge	For checking engine oil pressure.
10	09900-21602	Engine oil measuring cylinder	For measuring oil.
11	09930-10111	Spark plug wrench	For removing and installing plug.
12	09913-50110	Oil seal remover	For removing oil seal.
13	09920-70111	Snap ring opener	For removing snap rings.
14	09920-73110	Circlip remover	For removing and disassembling master cylinder.
15	09940-10122	Steering stem lock nut wrench	For tightening or loosening stem nut
16	09940-60112	Spoke nipple wrench	For adjusting spoke tension.
17	09900-20803	Thickness gauge	For adjusting gaps.
18	09900-25001	Pocket tester	For checking electrical equipment.
19	09900-27002	Timing tester	For adjusting ignition timing.
20	09900-28103	Electro tester	For checking electrical equipment.

21	09900-28401	Hydrometer	For reaching battery electrolyte specific gravity and anti-freeze concentration in engine coolant.
22	09930-30130	Rotor remover set	For removing alternator rotor.
23	09913-60910	Bearing puller	For removing 2nd gear.
24	09900-06904	8-mm "L" Allen wrench	For loosening caliper axle bolt.
*25	09914-73710	Water seal installer	For installing water pump oil seal.
*26	09914-73720	Oil seal installer No. 1	For installing oil pump oil seal.
*27	09914-73730	Oil seal installer No. 2	For installing water pump oil seal.



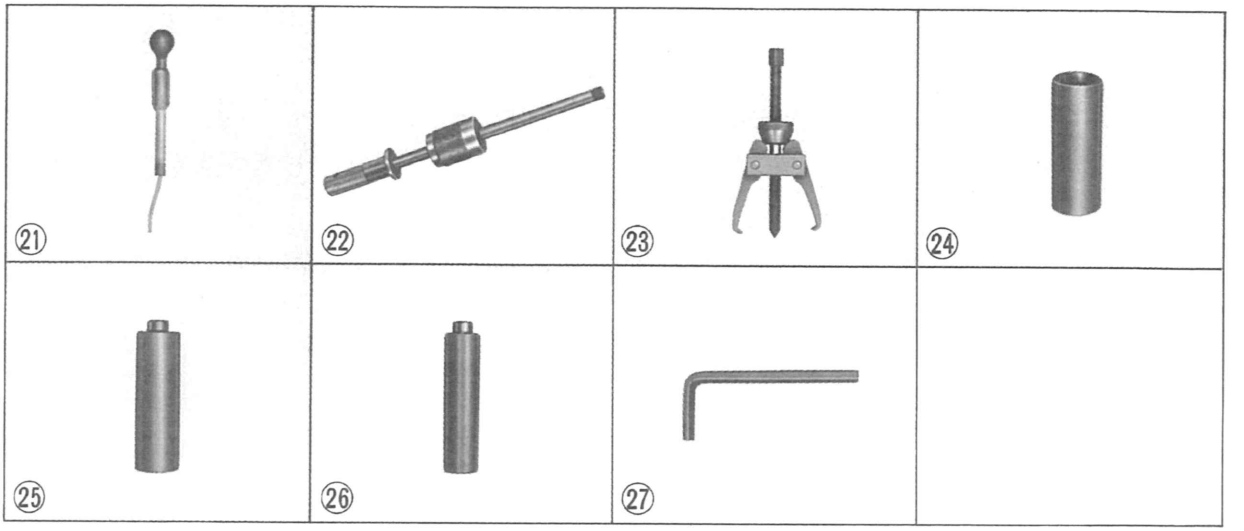


Fig. 1–1

1-5. NECESSARY MATERIALS

The materials listed below are needed for maintenance work on the RE5, and should be kept on hand for ready use. They are additions to such standard materials as cleaning fluids, lubricants, emery cloth and the like. **(Fig. 1-2)**

How to use them and where to use them are described in the text of this manual.

Ref. No.	Part number	Description or name
1	99000-32040	Thread lock cement
2	99000-32030	SUZUKI LOCK SUPER "103K"
3	99000-31030	SUZUKI BOND No. 4
4	99000-25100	SUZUKI brake pad grease
5	99000-25110	SUZUKI caliper axle grease

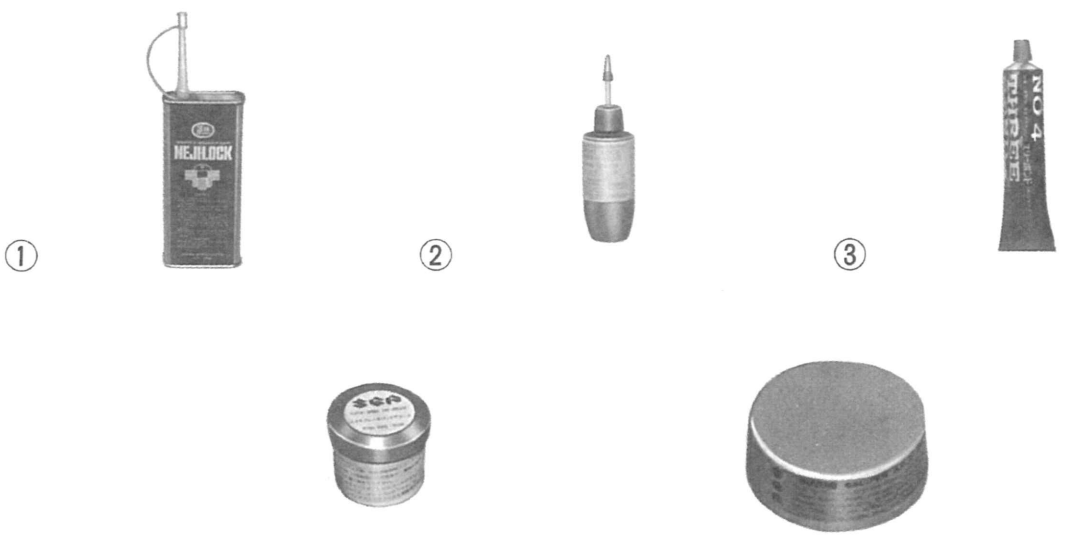


Fig. 1–2

REMOVAL & INSTALLATION OF ROTARY ENGINE UNIT

GROUP 2

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2-1. GENERAL DESCRIPTION

ENGINE DESCRIPTION

The rotary engine unit—the prime mover that distinguishes the RE5 from other motorcycles—is composed of precision-machined parts—rotor, eccentric shaft, side housings, rotor housing, to mention but major parts. During manufacture, each of these parts is individually checked for dimensional precision, finish workmanship and metallurgical quality. They are assembled and built into an engine through a series of steps which are stringently governed by a set of detailed rules and are required to meet many criteria.

The same high degree of technical standards and skill by which the rotary engines are disassembled and reassembled in the SUZUKI factory is required for overhauling or rebuilding the engines in the service shop if the overhauled or rebuilt engines are to live up to the SUZUKI standard in performance and durability. This is the reason why only those dealers whose servicing personnel have acquired that skill through training are authorized to extend their service to the engine internals.

The rotary engine in each RE5 motorcycle will be found "cacheted" with a lead pellet at the bottom section of the engine. A cacheted engine is under the SUZUKI Warranty. None but the authorized SUZUKI dealers mentioned above are empowered by SUZUKI to undo the cachet without voiding the Warranty.

LOCATING THE CAUSE OF ENGINE TROUBLE

Two kinds of complaint are envisaged, with which an RE5 motorcycle might be brought into the shop: "engine seizure," and "lack of power." Since the rotary engine itself is a trouble-free prime mover, such a complaint is usually the consequence of other malfunctions occurring in the devices external to the engine. This point should be kept in mind when you are called upon to deal with such a case. The lubrication system could be faulty, or the ultimate cause could be in the fuel system, ignition system or cooling system. Only when all these system are cleared, the blame may be put on the engine proper. Experience has amply corroborated the validity of this approach.

The recommended approach assumes that you are able to check and diagnose each system associated with the engine. The method is explained for each in this manual. Make it a firm rule to replace a complained engine only where all the evidence and the findings clearly indicate the cause to be within the engine.

COMPRESSION CHECK

The object of this test is to determine whether the internal condition of the engine is good enough for satisfying the performance criterion. The results are meaningful for the stated object when the following checking procedure has been followed:

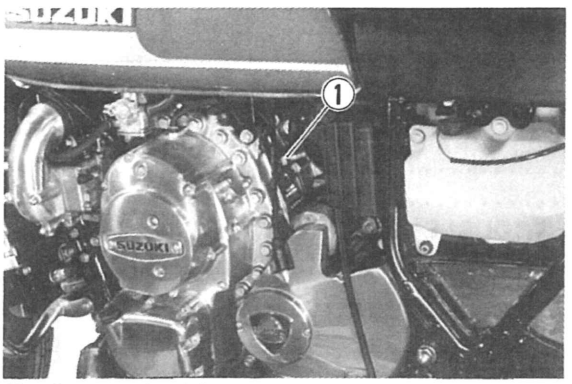

Fig. 2–1 1. Adaptor

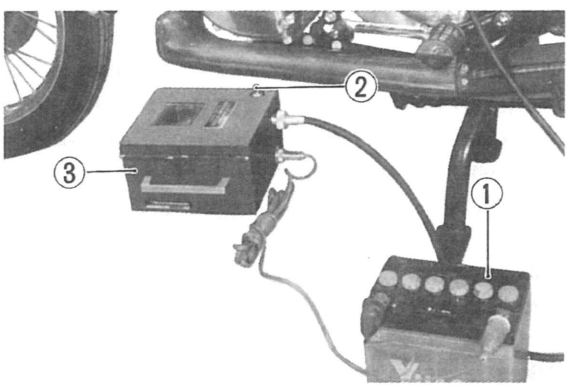

Fig. 2–2 1. Battery 2. Switch 3. Compression tester

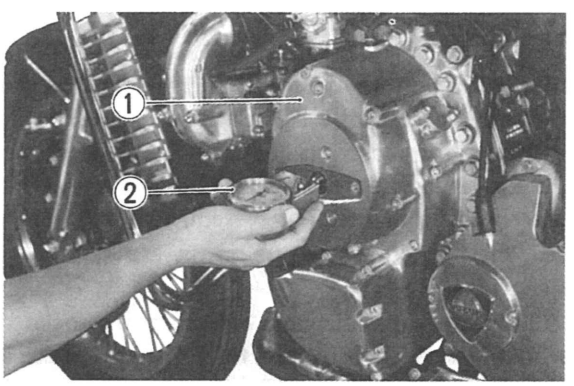

Fig. 2–3 1. Generator cover 2. Tachometer

1. Check to be sure that the battery is in fully charged state. Refer to **GROUP 11, BATTERY SYSTEM, page 101.**
2. Make sure that the metering oil pump adjustment is satisfactory by referring to the information given in **page 151.**
3. Start up and idle the engine for about 10 minutes to warm it up.
4. Remove the spark plug, and run the adaptor (for the **compression tester, Tool No. 09915-63710)** into the plug hole. Hook up the tester as shown in **Fig. 2-1.**
5. Connect the compression tester to the battery, using the lead wire as shown in **Fig. 2-2.**
6. Remove the generator inspection cap, and pull out the rubber plug. The cap is secured by two screws.
7. Turn on the compression switch, and wait for the recording paper to come out. It will take about 10 seconds for the paper to appear. Then, push the starter button to crank the engine about 10 seconds, with the throttle grip turned into "full throttle" position. During this cranking, read cranking speed with a tachometer. **(Fig. 2-3)**

   Upon cranking for 10 seconds, turn off the compression tester switch and tear off the recorded paper for examination.
8. For the value of eccentric shaft speed just read, determine, in the graph of **Fig. 2-4,** the lowert permissible compression pressure.

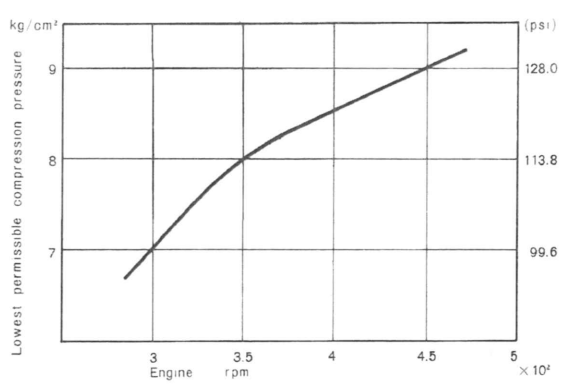

Fig. 2–4

Note: During the 10-second cranking, eccentric shaft runs with a speed of 300 to 400 rpm. Be sure to read the tachometer accurately.

The recorded pressure data are in the form of waves. Check the difference between the lowest permissible pressure and each peak of the waveform on the paper. Check, also, the differences among the peaks in terms of compression pressure. Remember, each wave represents a specific moving chamber in the engine. **(Fig. 2-5)**

Pass the verdict on the internal condition of the engine according to whether or not the engine satisfies the following two requirements:

(1) For each moving chamber, the compression pressure recorded is not lower than the speed-dependent lowest permissible pressure (mentioned above) determinable in the graph.

(2) The largest differential pressure between any two chambers is not greater than 0.5 kg/cm^2 (7.0 psi).

An engine failing to satisfy **both** needs overhauling and must be replaced.

2-2. REMOVAL AND INSTALLATION

a. Removal

1. Raise the seat, and undo the fuel tank hold-down band. **(Fig. 2-6)**
2. Move fuel cock lever into "ON" or "RES" and disconnect fuel hose from the cock.
3. Raise fuel tank just a little in place, and disconnect vacuum hose from fuel cock.
4. Disconnect fuel level gauge lead wire at the multi-lead connector in front of fuel tank. **(Fig. 2-7)**

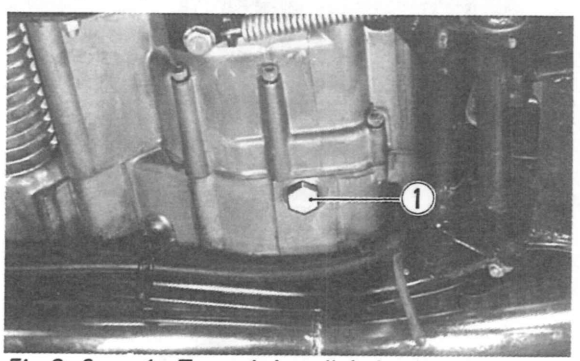

Fig. 2–9 1. Transmission oil drain plug

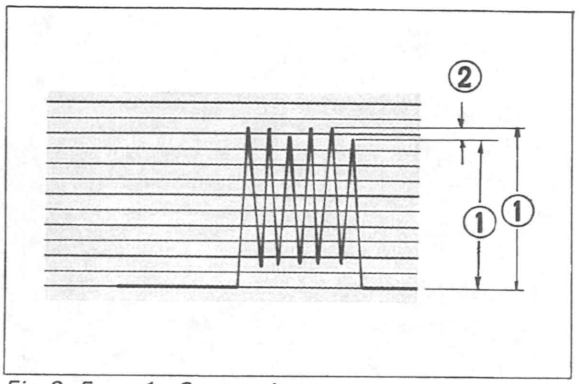

Fig. 2–5 1. Compression pressure 2. Differencial pressure

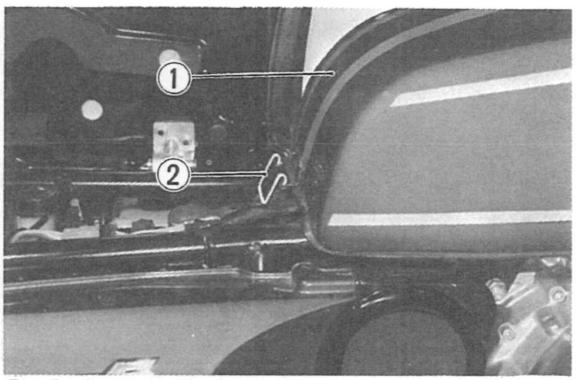

Fig. 2–6 1. Fuel tank 2. Fuel tank hold-down band

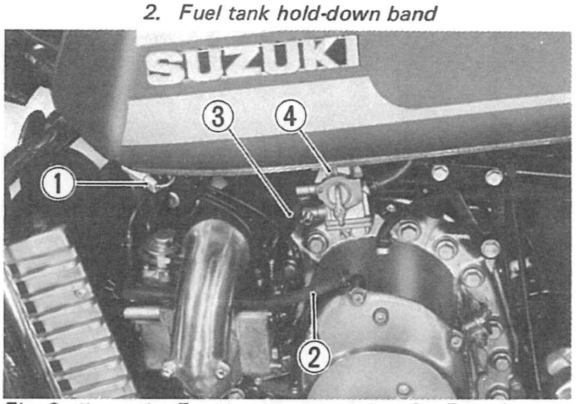

Fig. 2–7 1. Fuel level gauge lead 2. Fuel hose 3. Vacuum hose 4. Fuel cock

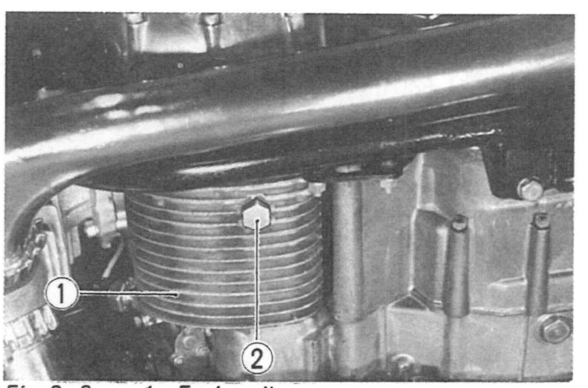

Fig. 2–8 1. Engine oil case 2. Engine oil drain plug

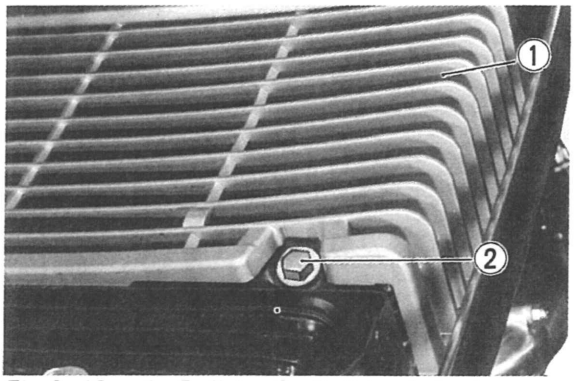

Fig. 2–10 1. Radiator 2. Radiator drain plug

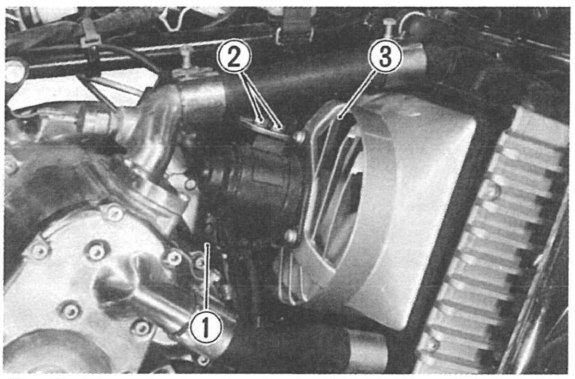

Fig. 2–11 1. Cooling fan lead 2. Setting bolt 3. Cooling fan

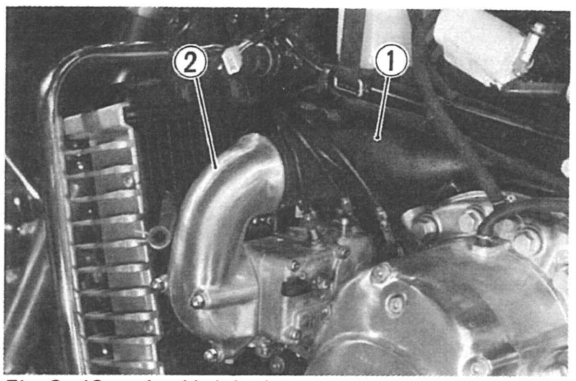

Fig. 2–12 1. Air inlet hose 2. Inlet hose connector

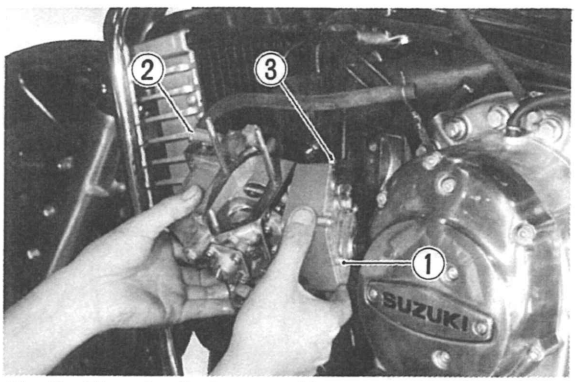

Fig. 2–13 1. Carburetor side cover 2. Metering oil inlet 3. Throttle cable

5. Take down fuel tank.
6. Drain out engine oil. Drain plug is located on the engine oil case bottom. **(Fig. 2-8)**
7. Drain out transmission oil. Drain plug is on the lower part of main case. **(Fig. 2-9)**
8. Drain out cooling water by loosening the drain plug located on the lower left-hand part of radiator. Be sure to have the radiator cap removed. **(Fig. 2-10)**

   Caution: If the engine is hot, push down the red button on the radiator cap to relieve the steam pressure inside, if any, before loosening the cap.
9. Disconnect cooling fan lead wire at the multi-lead connector, remove the two bolts securing the fan, and take off the fan. **(Fig. 2-11)**
10. Loosen the screw fastening the clamp on air inlet hose, and slide hose off inlet hose connector of the carburetor. **(Fig. 2-12)**
11. Loosen the three nuts securing the air inlet hose connector to the carburetor and remove hose connector. **(Fig. 2-12)**
12. Disconnect the oil line (extending from metering oil pump) from the carburetor by loosening the union bolt on carburetor top.
13. Remove the 3 nuts securing the carburetor in place, and take out carburetor.
14. Remove the 4 screws on carburetor side cover, remove the cover from carburetor proper, and disconnect throttle cable from throttle valve pulley. **(Fig. 2-13)**
15. Remove pillion footrests. Undo the exhaust pipe clamps, and remove right-side and left-side mufflers. **(Fig. 2-14)**

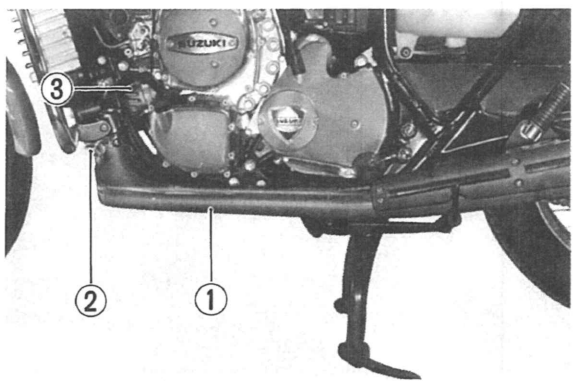

Fig. 2–14 1. Muffler 2. Exhaust pipe clamp 3. Exhaust manifold.

16. Remove the nuts securing exhaust and intake manifolds to the engine, and take out the manifolds.

17. Remove right-side footrest. This footrest is secured by two bolts.

18. Loosen the rear brake adjusting nut. **(Fig. 2-15)**

19. Loosen three screws fastening the clutch release inspection cap to the sprocket cover, and detach the cap.

20. Remove the Allen-head bolts securing the engine sprocket cover. Use the **5-mm "T" Allen wrench (Tool No. 09911-73730).** **(Fig. 2-16)**

21. Undo the clamps holding down the alternator lead wire, and disconnect the wire from multi-lead connector. **(Fig. 2-17)**

22. Remove the 9 Allen-head bolts securing the alternator cover, and take off the cover. **(Fig. 2-18)**

23. Hold the alternator rotor immoable by fitting the **holder (Tool No. 09915-53710),** as shown, and loosen rotor retaining bolt. **(Fig. 2-19)**

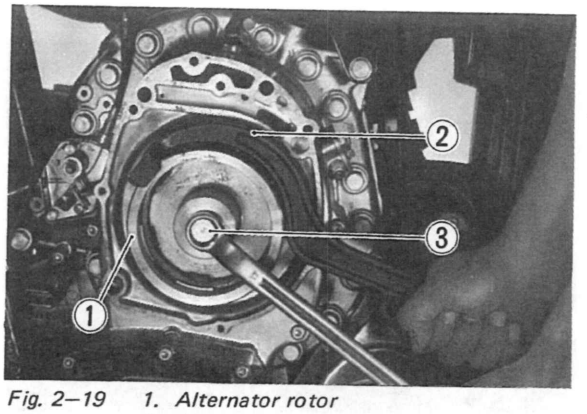

Fig. 2–19 1. Alternator rotor
2. Alternater rotor holder
3. Alternator rotor bolt

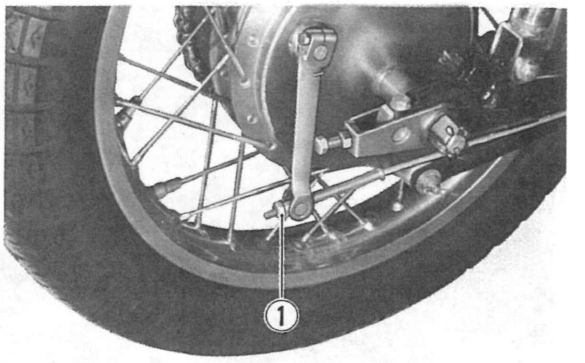

Fig. 2–15 1. Rear brake adjusting nut

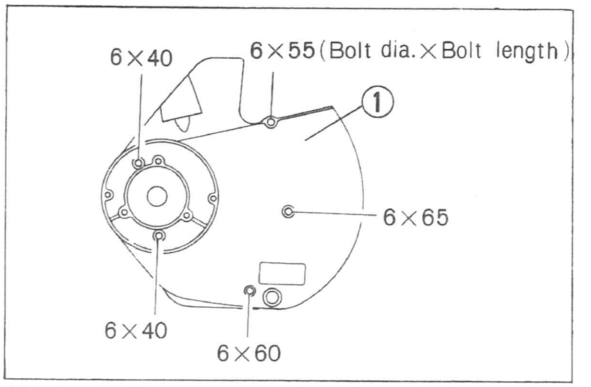

Fig. 2–16 1. Engine sprocket cover

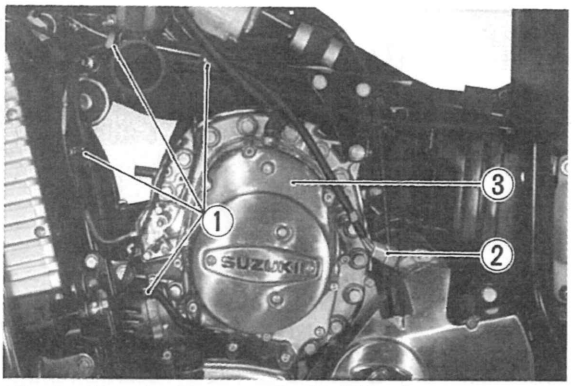

Fig. 2–17 1. Clamp 2. Multi-lead connector
3. Generator cover

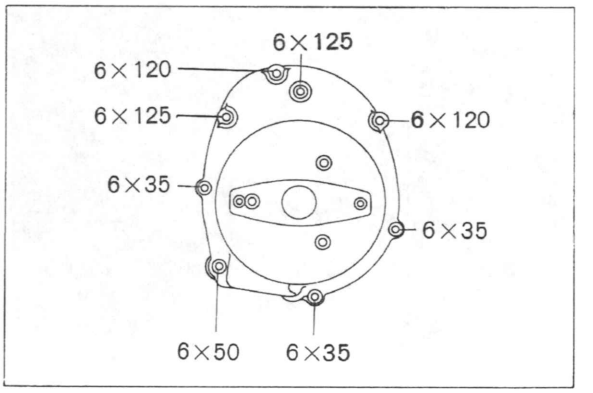

Fig. 2–18 1. Generator cover

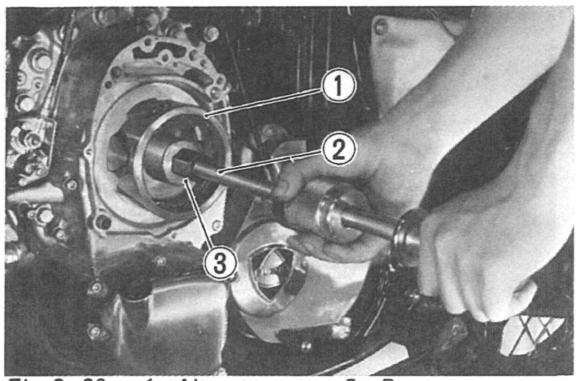

Fig. 2–20 1. Altenator rotor 2. Rotor remover 3. Alternator rotor puller

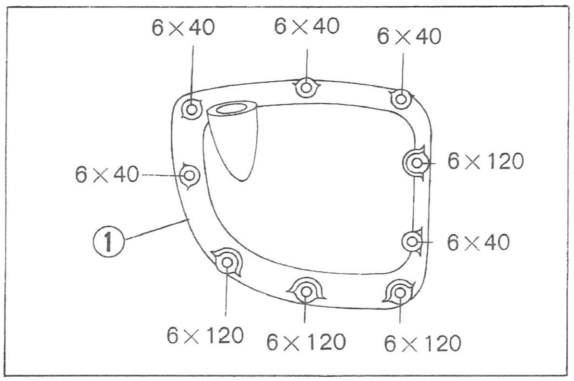

Fig. 2–21 1. Counterweight cover cap

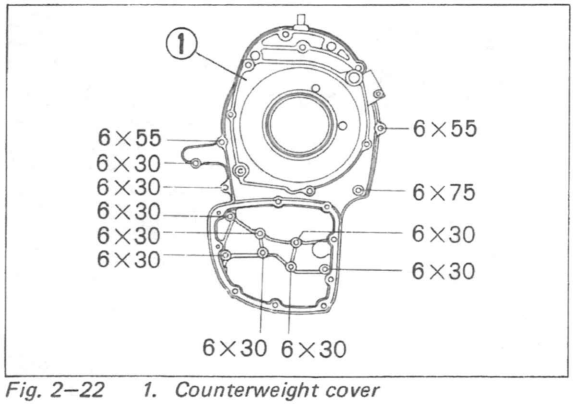

Fig. 2–22 1. Counterweight cover

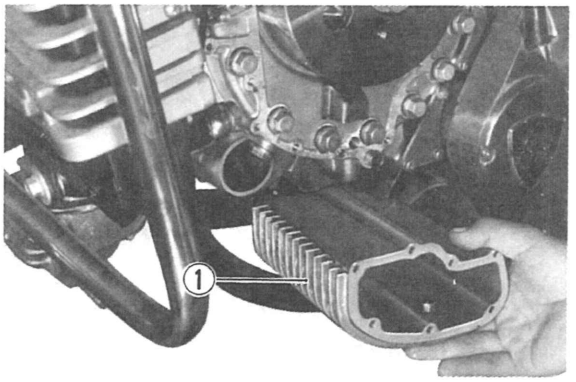

Fig. 2–23 1. Engine oil case

24. Using the tool set **(rotor puller, Tool No. 09930-33710,** and **rotor remover, Tool No. 09930-30130),** extract alternator rotor from eccentric shaft. **(Fig. 2-20)**

25. Remove counterweight cover cap. Removing 9 Allen-head securing bolts allows the cap to come off **(Fig. 2-21)**

26. Pull blowby gas hose off counterweight cover. Remove the 12 bolts securing the cover and take the cover off. **(Fig. 2-22)**

27. Detach engine oil case from main case, and take out the oil case. **(Fig. 2-23)**

28. Let out the cooling water remaining within the engine by loosening the drain plug. This plug is located on bottom part of left-side housing. **(Fig. 2-24)**

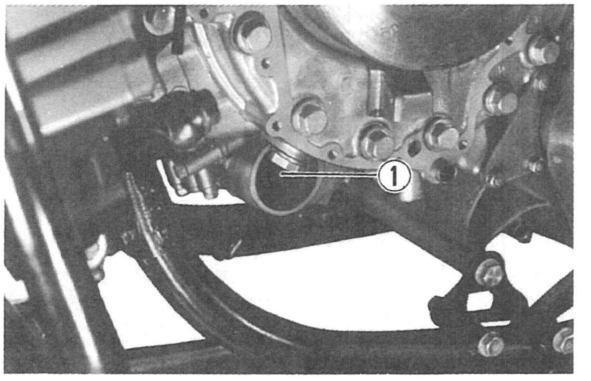

Fig. 2–24 1. Water drain plug

29. Detach port valve cover by loosening the cover holder screw. Disconnect throttle cable ends from port valve levers. **(Fig. 2-25)**
30. Pull out tachometer drive cable from clutch cover.
31. Disconnect from multi-lead connector the lead wire extending from contact breaker assembly.
32. Remove two water hoses, top and bottom, connecting radiator to engine. When undoing the clamped hose connections, be sure to loosen the clamp-tightening screws all the way. **(Fig. 2-26)**
33. Remove the 2 screws securing the metering pump cover, and detach the cover.
34. Disconnect metering pump control cable from control lever. **(Fig. 2-27)**
35. Draw out engine oil hose from metering pump. This hose extends from metering oil tank. Plug up the free end of the hose to avoid oil spilling. **(Fig. 2-27)**

36. From the switch located on water hose connector, disconnect cooling fan switch lead wire. **(Fig. 2-28)**

37. Clutch cover is secured to main case by a total of 25 Allen-head bolts. Remove these bolts, and take clutch cover off main case. **(Fig. 2-29)**

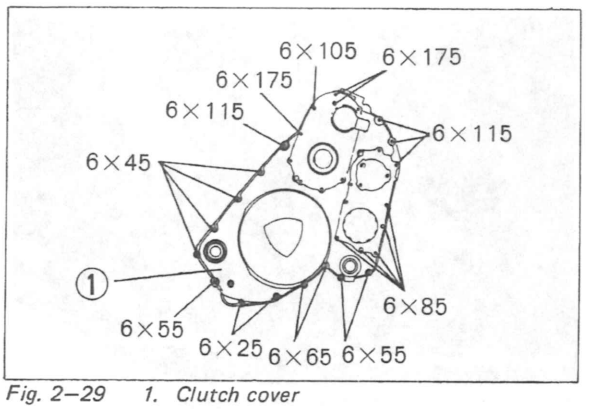

Fig. 2–29 1. Clutch cover

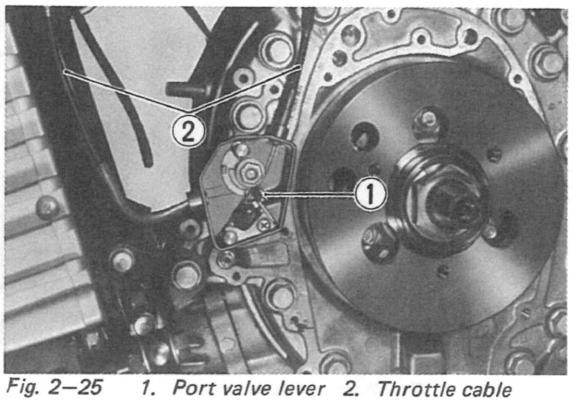

Fig. 2–25 1. Port valve lever 2. Throttle cable

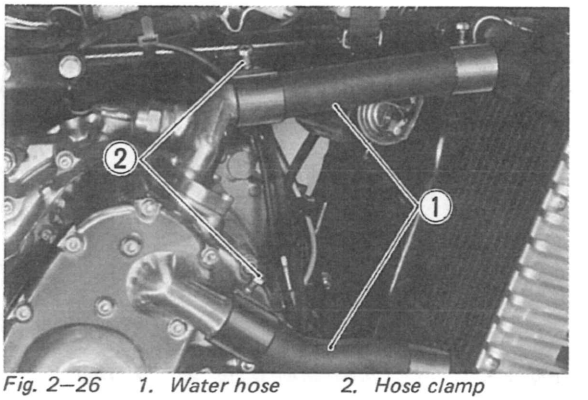

Fig. 2–26 1. Water hose 2. Hose clamp

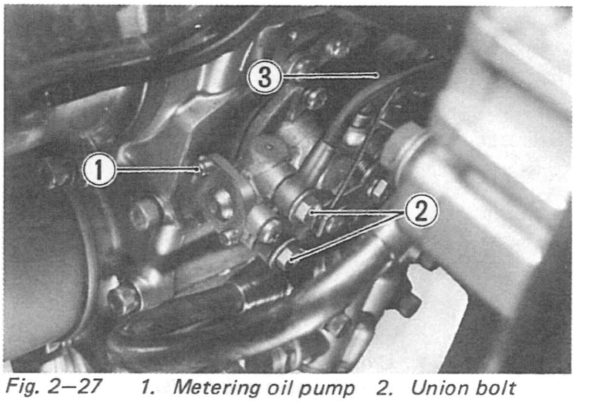

Fig. 2–27 1. Metering oil pump 2. Union bolt 3. Oil tank hose

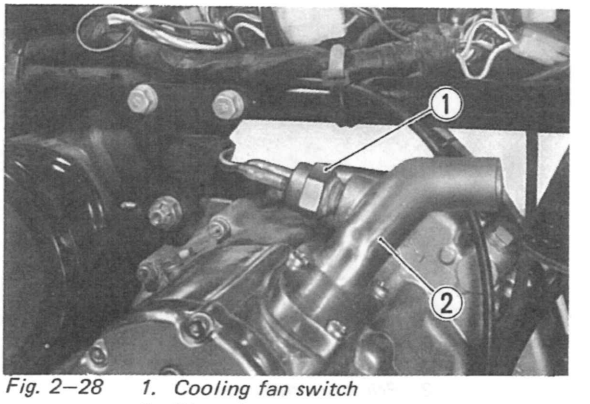

Fig. 2–28 1. Cooling fan switch 2. Water hose connector

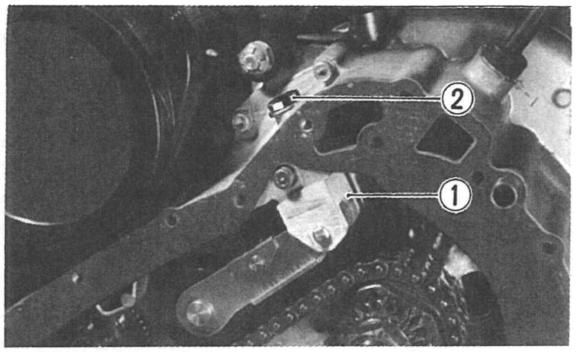

Fig. 2–30 *1. Primary chain tensioner*
2. Chain tensioner bolt

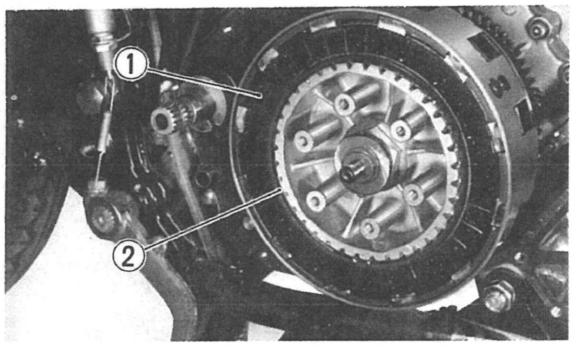

Fig. 2–31 *1. Clutch drive plate 2. "V" ring*

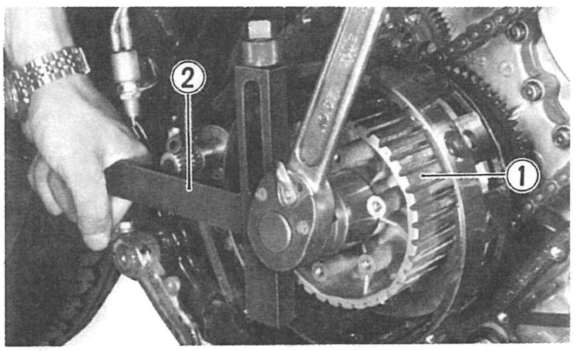

Fig. 2–32 *1. Clutch sleeve hub*
2. Clutch sleeve hub holder

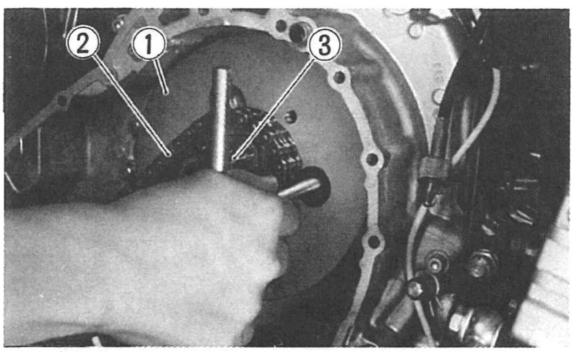

Fig. 2–33 *1. Right-side counterweight*
2. Primary drive chain
3. Timing drive gear

38. Loosen the two bolts and remove primary drive chain tensioner. **(Fig. 2-30)**
39. Loosen the 6 bolts on pressure disc, and remove 6 springs. Take off pressure disc, clutch drive plates and driven plates and "V" rings. **(Fig. 2-31)**
40. Using the tool set **(hub holder, Tool No. 09920-53710,** and 32-mm "T" handle socket wrench), remove the nut retaining the clutch sleeve hub. **(Fig. 2-32)**
41. Remove the nut retaining the right-side counterweight, primary sprocket and timing gear, all on the output shaft. Use a 32-mm box wrench. To lock the counterweight so that the nut can be torqued, insert a 12-mm "T" handle socket wrench into one of the three holes provided in the counterweight to fit the socket onto a bolt head (on right-side housing) inside, and hold the "T" handle to prevent the counterweight from turning with the nut. **(Fig. 2-33)**
42. Remove timing gear by drawing it off eccentric shaft.
43. Take out woodruff key from the keyway provided in eccentric shaft. It is by this key that timing gear is locked to the shaft. It may be necessary to pry the key off the keyway.
44. Remove clutch housing and primary sprocket together, complete with chain and starter clutch gear. Be sure to hold the sprocket and gear true and square relative to eccentric shaft and countershaft as they slide off these shafts. **(Fig. 2-34)**

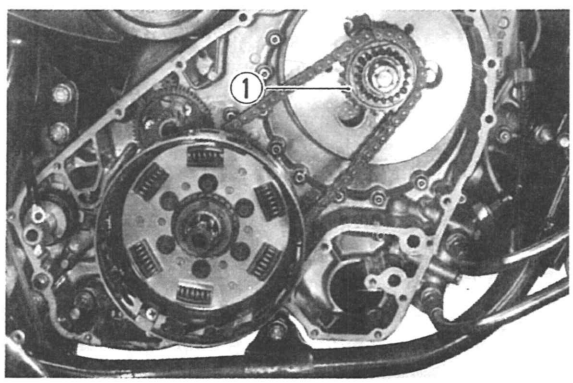

Fig. 2–34 *1. Primary drive sprocket*

45. Disconnect air breather hose (for venting air out of cooling circuit)from the top of left-side housing. **(Fig. 2-35)**
46. Remove the engine mounting bolts, by which the engine is supported from the frame. **(Fig. 2-36)**
47. Loosen the 16 Allen-head bolts securing the rotary engine unit to the main case. Remove the bolts and take down the rotary engine unit **(Fig. 2-37)**

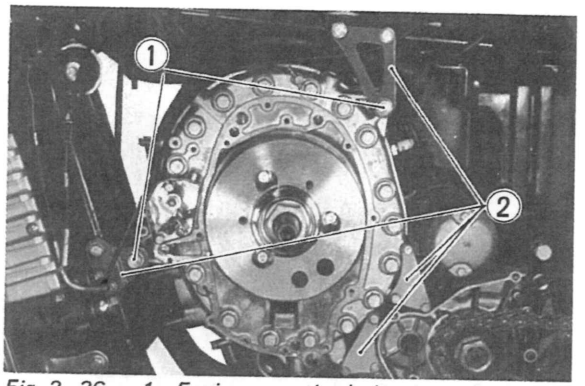

Fig. 2–36 1. Engine mounting bolt 2. Engine mounting plate

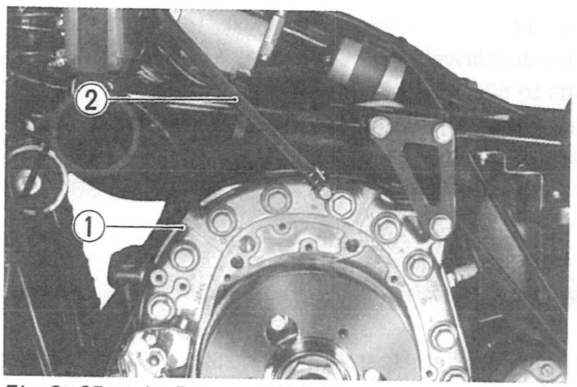

Fig. 2–35 1. Rotary engine unit 2. Water breather hose

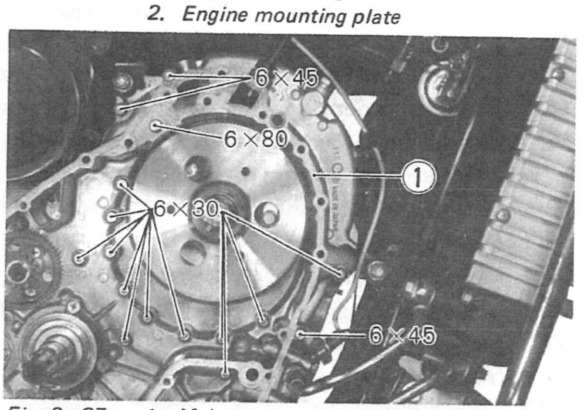

Fig. 2–37 1. Main case

b. Installation

1. Position the rotary engine in place, and secure it to the main case and frame. Tighten the mounting bolts and nuts and the Allen-head bolts. The mounting nuts are to be tightened to a torque value of **250** to **400 kg-cm(18 ~ 29 ft-lb)** and the Allen-head bolts to **80** to **90 kg-cm (6.0 ~ 6.6 ft-lb).**
2. Install the clutch housing, primary drive chain and sprocket by reversing the order to their removal. Tighten the timing gear nut to **2500 kg-cm (180 ft-lb).**
3. Install the clutch sleeve hub. Secure it in place by tightening its retaining nut to a torque value of **250** to **400 kg-cm (18 ~ 29 ft-lb).**
4. Assemble the clutch in place. After putting on the pressure disc, tighten each spring bolt to anywhere between **60** and **70 kg-cm (4.4 ~ 5.1 ft-lb).**
5. Position the primary chain tensioner in place and secure it by tightening its mounting bolts to **100 kg-cm (7.3 ft-lb).**
6. Install the clutch cover as follows: Turn the right-side counterweight to index the line mark (engraved on the counterweight) to the line cast out on the main case **(Fig. 2-38);** similarly index the punch mark (on one of the timing driven gear teeth) to the arrowhead standing on the clutch cover **(Fig. 2-39);** and fit the clutch cover in this condition. Secure the cover by tightening the Allen-head bolts to a torque value of **80** to **90 kg-cm (6.0 ~ 6.6 ft-lb).**

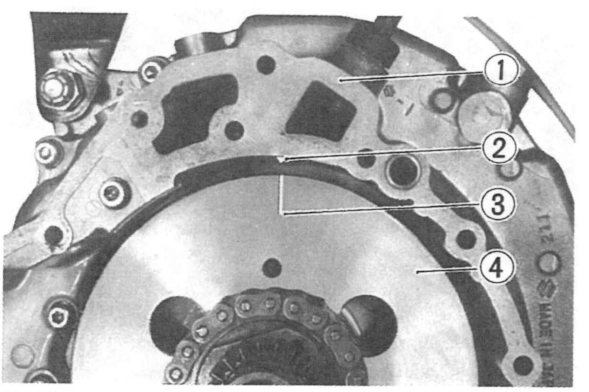

Fig. 2–38 1. Main case 2. Cast out line 3. Line mark 4. Counterweight

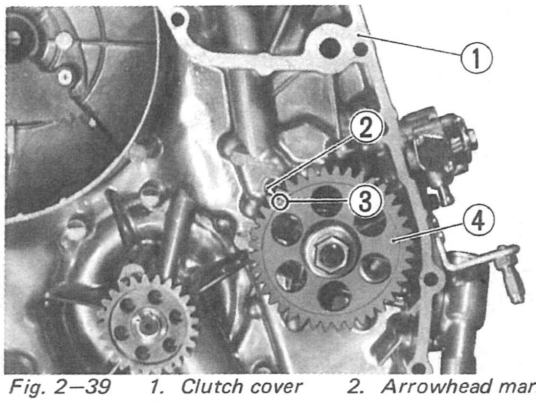

Fig. 2–39 1. Clutch cover 2. Arrowhead mark 3. Punch mark 3. Timing driven gear

7. Connect the metering oil pump cable and hoses to the pump. Tighten the union bolts by torquing up to **20 ~ 30 kg-cm (1.4 ~ 2.2 ft-lb).**
8. Connect the water hoses in place and clamp the connections securely.
9. Attach the tachometer cable to the tachometer gear box.
10. Connect the throttle cables to the port valve levers.
11. Insert the engine oil case to the main case.
12. Install the counterweight cover and tighten Allen-head bolts to **80 ~ 90 kg-cm (6.0 ~ 6.6 ft-lb).**
13. Connect the blowby gas hose to the connector on the counterweight cover.
14. Install the counterweight cover cap. Tighten the bolts to **80 ~ 90 kg-cm (6.0 ~ 6.6 ft-lb).**
15. Mount the alternator rotor on the eccentric shaft. Using the alternator rotor holder to hold the rotor steady, tighten the rotor retaining bolt to **500 kg-cm (36 ft-lb)**.
16. Secure the alternator cover to the counterweight cover, and tighten the securing bolts to **80 ~ 90 kg-cm (6.0 ~ 6.6 ft-lb)**.
17. Make electrical connections of lead wires extending from the alternator cover.
18. Install the engine sprocket cover, and tighten its securing bolts to **80 ~ 90 kg-cm (6.0 ~ 6.6 ft-lb)**.
19. Fit the clutch inspection cap to the sprocket cover.
20. Install the exhaust and intake manifolds, followed by the muffler. Install the footrests.

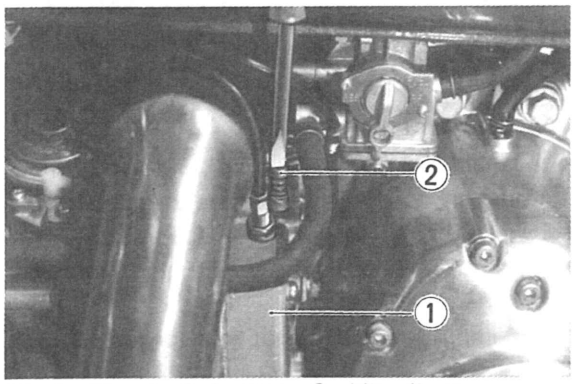

Fig. 2–40 1. Carburetor 2. Idle adjusting screw

21. Connect the throttle cables to the throttle valve pulley. Fit and secure the side cover to the carburetor body. Have the idling adjusting screw loosened all the way: this screw is on the side cover, as shown. **(Fig. 2-40)**
23. Connect the metering oil hose to the carburetor fuel inlet and tighten the union bolt to **20 ~ 30 kg-cm (1.4 ~ 2.2 ft-lb).**
24. Adjust the port valve opening angle in accordance with the instruction given in **GROUP 16-2, 9.**
25. Install the cooling fan.
26. Install drain plugs for cooling water, engine oil and transmission oil.
27. Mount the fuel tank by reversing the dismounting procedure.
28. Fill in **appox. 2.5ℓ (5.3/4.4 US/Imp. pt.)** of the specified rotary engine oil through the oil filler, which is in the counterweight cover cap.
29. Fill in **1600 cc (3.28/2.84 US/Imp. pt.)** of the specified transmission oil through the filler, which is in the clutch cover. Use a measuring cylinder. **(Fig. 2-41)**
30. Fill in cooling water through the radiator. Information necessary for preparing an anti-freeze coolant is provided in **GROUP 16-2, 15 "Service coolant".**

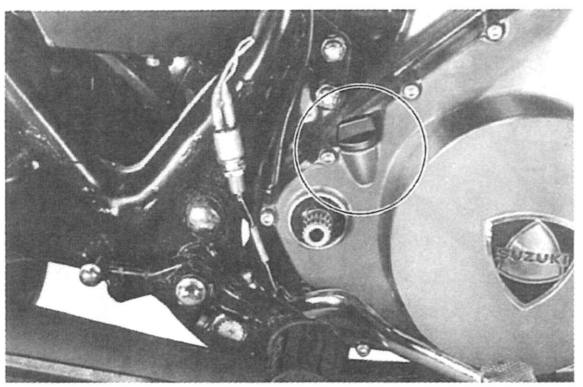

Fig. 2–41

31. Run the engine to bring the coolant temperature to the normal operating level. Finally, check the coolant level and the engine oil level—when the engine has cooled off. Add make-up oil and water to raise the oil and water, respectively, to the specified levels if necessary. Cooling water should be up to the level plate in the radiator filler. as shown in **Fig. 2-42.**

    Engine oil should be up to the upper level mark on the dip stick, as shown in **Fig. 2-43.**

32. Adjust the engine idle speed to 1200 rpm by means of the idling adjusting screw.

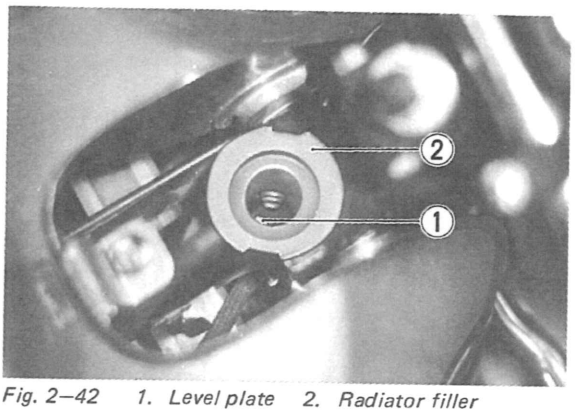

Fig. 2–42 1. Level plate 2. Radiator filler

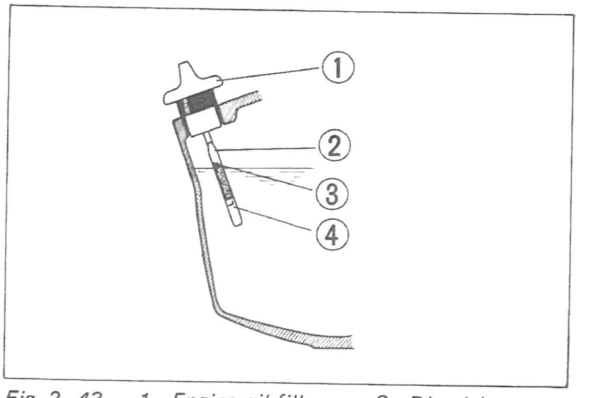

Fig. 2–43 1. Engine oil filler 2. Dipstick
3. Upper level mark
4. Lower level mark

PRIMARY DRIVE, CLUTCH & TRANSMISSION

GROUP 3

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3-1. GENERAL DESCRIPTION

DESCRIPTION

Primary drive chain transmits engine output power from primary drive sprocket, mounted on the eccentric shaft, to primary driven sprocket, mounted on the clutch sleeve hub. Initial speed reduction takes place in this chain drive.

Power flows from clutch sleeve hub to the countershaft through the driving and driven plates of the clutch, and is then transmitted to the final drive sprocket through a selected train of gears on countershaft and drive shaft. Second speed reduction takes place in the gear train.

SPECIFICATIONS

PRIMARY DRIVE CHAIN:	Number of links	72
	Pitch	9.525 mm (0.3750 in.)
	Type	Endless two-row chain
	Primary reduction ratio	1.652 (38/23)
GEAR RATIOS:	Low	2.846 (37/13)
	2nd	1.736 (33/19)
	3rd	1.363 (30/22)
	4th	1.125 (27/24)
	Top	0.923 (24/26)

Item	Standard	Service limit
Primary drive chain stretch	276.225 mm/30 pins (10.875 in./30 pins)	279.0 mm/30 pins (10.98 in./30 pins)
Clutch drive plate	3.4 ~ 3.6 mm (0.134 ~ 0.142 in.)	3.2 mm (0.126 in.)
Clutch spring free length	40.5 mm (1.590 in.)	39.0 mm (1.535 in.)
Clutch release screw backing	¼ ~ ½ turn	———
Clutch lever play at bottom end	4 mm (0.16 in.)	———

TROUBLE-SHOOTING

Symptom	Probable cause	Remedy
Slipping clutch	1. No play in the clutch lever	Adjust
	2. Some clutch springs are weakened	Replace weakened springs
	3. Worn or glazed clutch drive plate	Replace
	4. Not enough oil in the transmission	Add oil
Dragging clutch	1. Clutch lever play too much	Adjust
	2. Too much oil in the transmission	Lower oil surface to prescribed level
Grabbing clutch	1. Clutch driven plate is warped	Replace
	2. Clutch drive plate is warped	Replace
	3. Bent countershaft	Replace

3-2. PRIMARY DRIVE

a. Description

The primary drive sprocket, mounted on the eccentric shaft, has 23 teeth; the primary driven sprocket, mounted on the clutch housing, has 38 teeth. The reduction ratio in primary drive is therefore 1.652 (= 38/23).

The primary drive chain is of two-row type consisting of three trains of links with two rows of pins. It is kept in tension by the chain tensioner.

b. Disassembly

To disassemble the primary drive mechanism, remove the clutch cover as outlined in **2-2, pages 9 to 11 and 13 to 15.**

Note: As the clutch cover is detached for removal, cooling water remaining in the water jacket will spill down from above the main case to wet the case, chain and others. This spill is inevitable. Be sure to wipe the spilled water off with a dry cloth.

c. Inspection

1. Visually inspect the drive and driven sprockets for tooth wear. If the teeth are excessively worn or if any teeth are found broken, replace the sprocket.
2. Closely examine the chain for evidence of cracking. Replace the chain if any such evidence is noted.

3. Check the chain for permanent elongation (stretch) as follows: Select any portion of the chain at random; lay it flat and straight on the level surface of the bench; apply a pull of 20 to 30 kg (44 ~ 66 lb) to the laid-down chain; and measure its length comprising **30 pins,** as shown in **Fig. 3-1**. This length, or distance from the center of the end pin to the center of the other end pin, should be not greater than **279.0 mm (10.98 in.).** If the 30-pin length is found to exceed this limit, it means that the chain has developed too much play on its pins to remain in service; such a chain must be replaced by a genuine SUZUKI replacement chain.

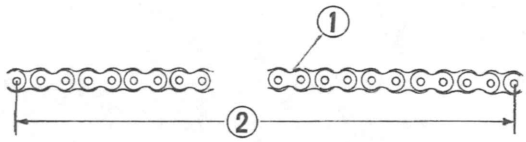

Fig. 3–1 1. Primary drive chain 2. Distance

4. Visually inspect the chain tensioner roller for signs of cracking and wear. Replacement is necessary if the roller is cracked or in excessively worn condition.
5. Inspect the the chain tensioner spring for signs of cracking and replace the spring as necessary.

d. Reassembly

Primary drive reassembly is to be carried out by reversing the disassembly procedure. There is one point in particular, among others, which requires attention in reassembling work: Be sure to mount the timing gear in the correct orientation, in which the tapered ends of gear teeth point outward, as shown in **Fig. 3-2.**

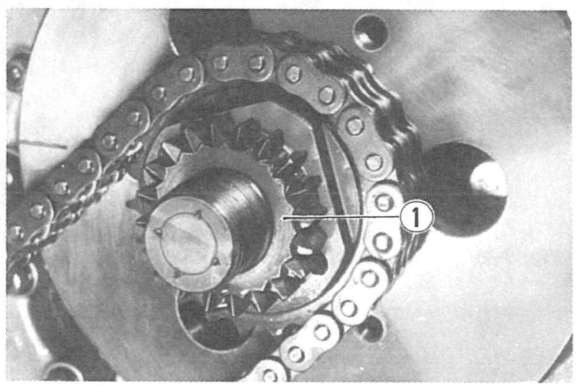

Fig. 3–2 1. Timing drive gear

3-3. CLUTCH

a. Description

The clutch is of wet multi-plate type, consisting of 8 cork-mold drive plates, 7 driven plates, sleeve hub, pressure plate and 6 pressure springs, all enclosed by the clutch housing, as shown in the cross section of **Fig. 3-3.**

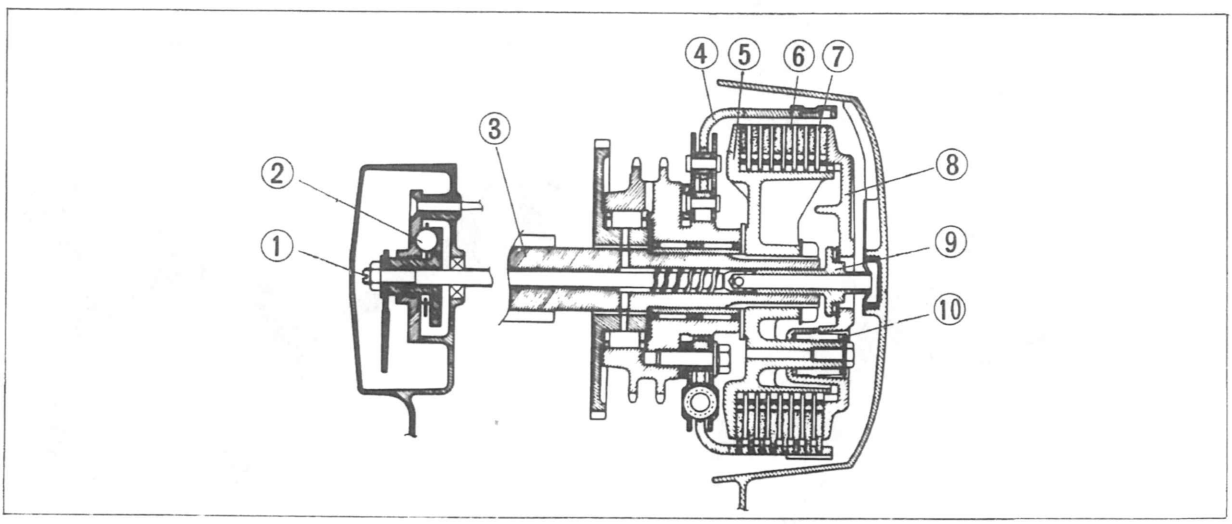

Fig. 3–3 1. *Release screw* 2. *Release ball* 3. *Push rod* 4. *Housing* 5. *Sleeve hub* 6. *Drive plate* 7. *Driven plate* 8. *Pressure disc* 9. *Push piece* 10. *Pressure spring*

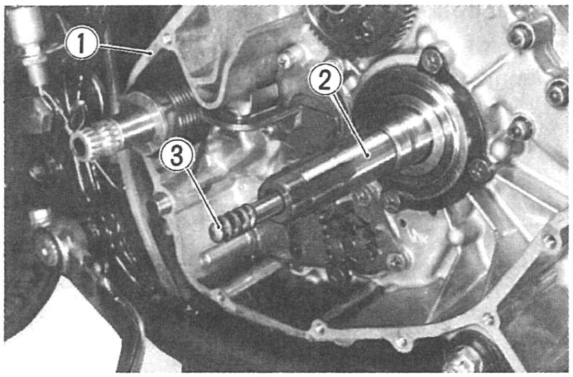

Fig. 3–4 *1. Main case 2. Countershaft 3. Push rod*

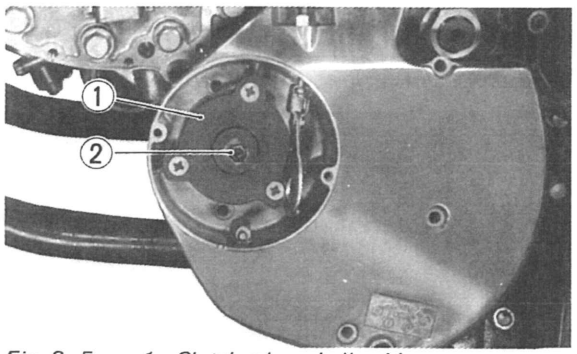

Fig. 3–5 *1. Clutch release ball guide 2. Clutch release screw*

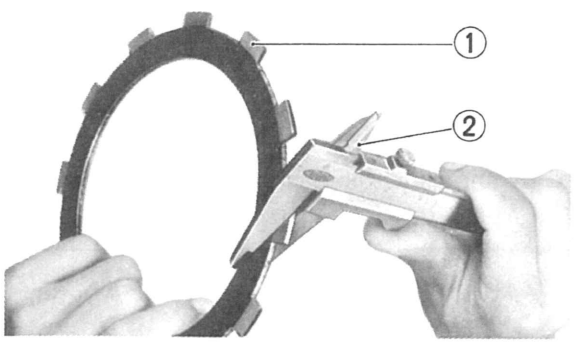

Fig. 3–6 *1. Clutch drive plate 2. Caliper rule*

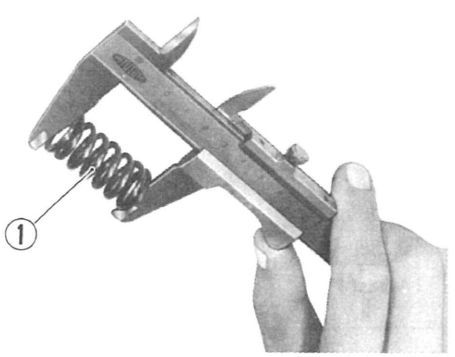

Fig. 3–7 *1. Clutch spring*

b. Disassembly

1. Remove the clutch cover and engine sprocket cover, and disassemble the clutch. The procedures are outlined in **2-2, pages 9** to **11** and **13** to **15.**
2. At the left-hand side of the transmission case, give a push to the clutch release push rod, and from the countershaft on the right, draw the push rod. **(Fig. 3-4)**
3. Loosen the screws securing the clutch release ball guide, and disassemble the clutch release device **(Fig. 3-5).**

c. Inspection

1. Check the clutch drive plates for wear by measuring the thickness of each plate with a caliper rule. Plates measuring less than **3.2 mm (0.126 in.)** must be replaced. **(Fig. 3-6)**
2. Check each clutch spring for free length, as shown in **Fig. 3-7.** Springs measuring less than **39.0 mm (1.535 in.)** must be replaced. Before installing the 6 springs in place, check to be sure they are of the same length (free length). **(Fig. 3-7)**
3. Check each clutch driven plate for warpage as shown in **Fig. 3-8,** that is, by placing the plate on a surface plate and by reading the clearance with a thickness gauge. If a reading greater than **0.3 mm (0.012 in.)** results, repair or replace the plate. **(Fig. 3-8)**
4. Inspect the clutch "V" rings for damage, and replace them as necessary.
5. Inspect the clutch release ball, ball guides and release lever spring for wear, cracks or any other damage, and replace them as necessary.

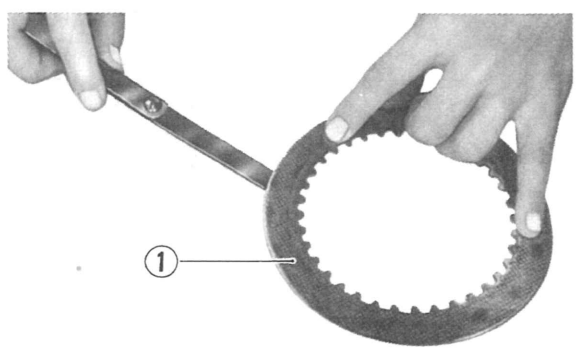

Fig. 3–8 *1. Clutch driven plate*

d. Reassembly

The clutch cover is to be assembled by reversing the disassembling procedure and by adhering to the following instruction:

Install the engine sprocket cover on the transmission core, and assemble the clutch release device by referring to **Fig. 3-5** above.

3-4. TRANSMISSION

a. Description

The transmission is of 5-speed constant mesh type, whose gears mesh in as shown in the following 6 figures:

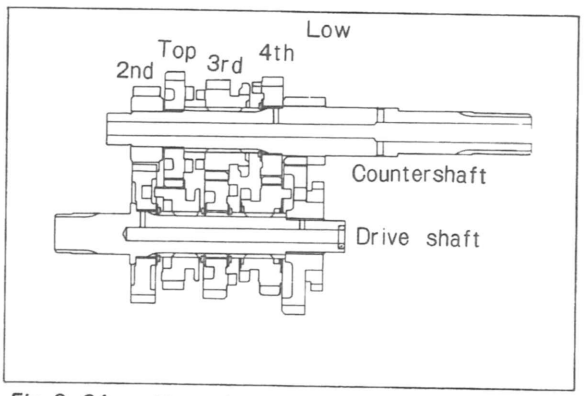

Fig. 3–9A Neutral

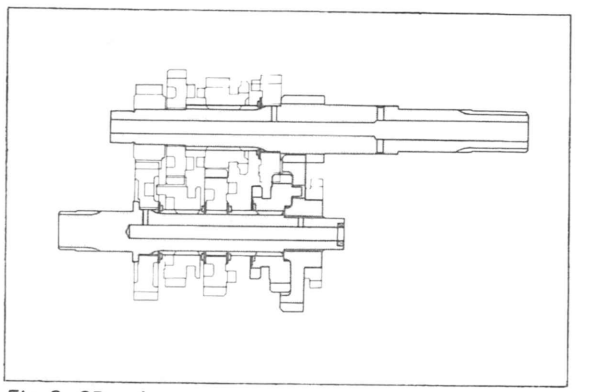

Fig. 3–9B Low gear

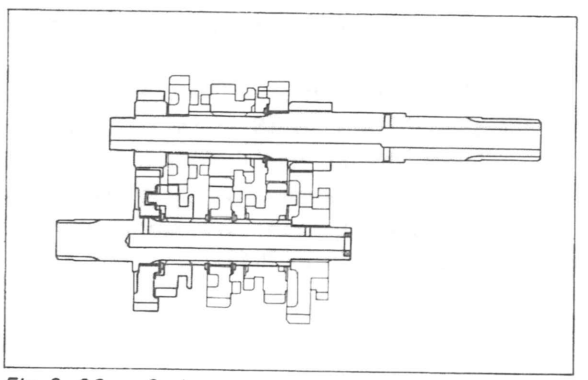

Fig. 3–9C 2nd gear

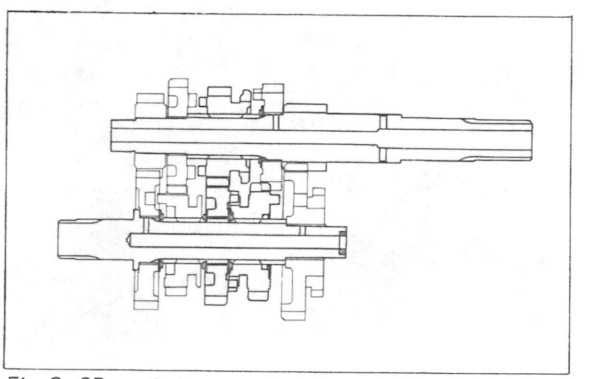

Fig. 3–9D 3rd gear

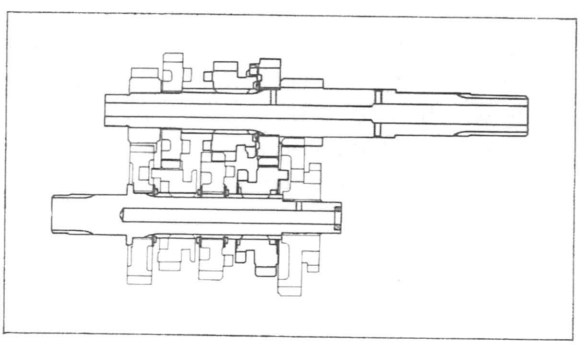

Fig. 3–9E 4th gear

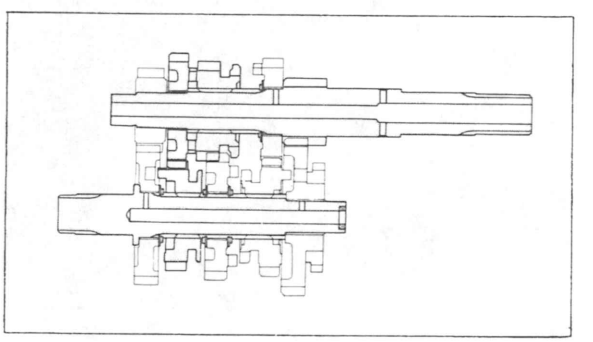

Fig. 3–9F Top gear

The shift mechanism consists of three shift forks, shift cam, driven gear, shift shaft and shift lever. Depressing the shift lever rotates the shift arm on the shift shaft, causing the shift cam driven gear to rotate the shift cam. As the shift cam rotates, the shift forks move sideways by the cam action of the groove cut on the shift cam.

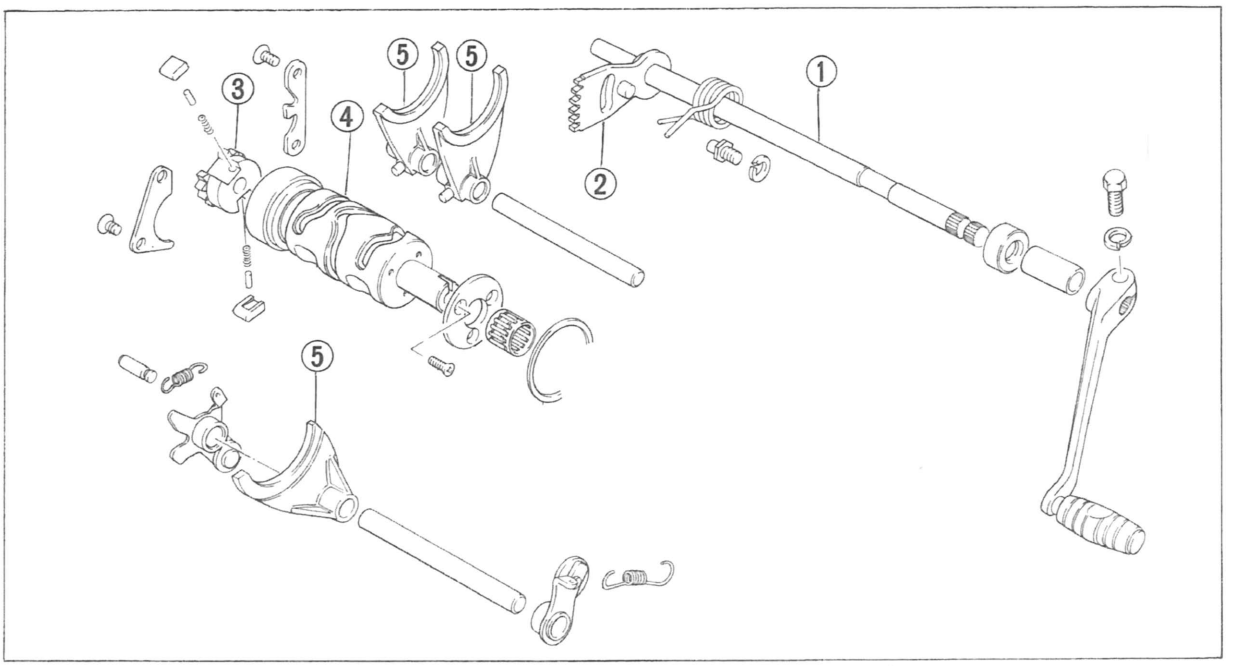

Fig. 3–10 1. Gear shift shaft 2. Gear shift arm 3. Gear shift cam driven gear 4. Gear shift cam 5. Gear shift fork

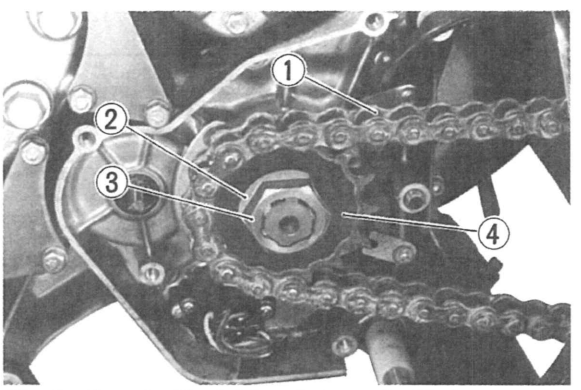

Fig. 3–11 1. Final drive chain 2. Washer 3. Nut 4. Engine sprocket

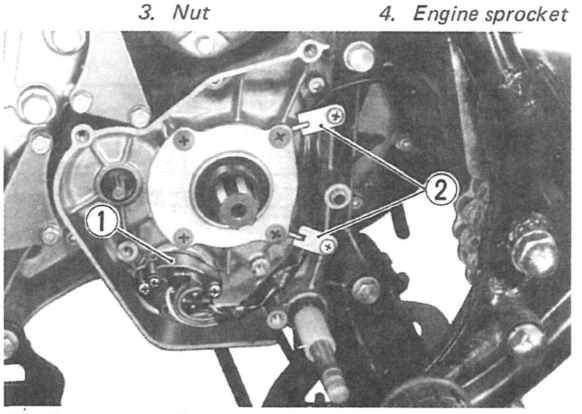

Fig. 3–12 1. Gear position indicator switch 2. Set plate

b. Disassembly

1. Carry out the removal procedure outlined in **2-2** but do not remove the rotary engine unit from the main case. In other words, all the steps from **1.** to **46.** are to be carried out.
2. Unlock the nut retaining the drive shaft of final drive by bending down the tongue of the washer; loosen the nut; and remove the final drive sprocket. **(Fig. 3-11)**
3. Loosen the 2 screws securing the gear position indicator switch to the transmission case, and take off the switch. Undo the plates holding down the lead wire extending from the switch. **(Fig. 3-12)**
4. Disconnect the lead wires from the thermo senser and from the starting motor.

5. Loosen oil pipe union bolts (on the oil cooler) and oil pipe nut (on the pressure regulator), as shown in **Fig. 3-13.**
6. Remove 3 mounting bolts and 2 mounting plates securing the transmission case and main case together. The 2 mounting plates are fastened down by 3 bolts. **(Fig. 3-14)**

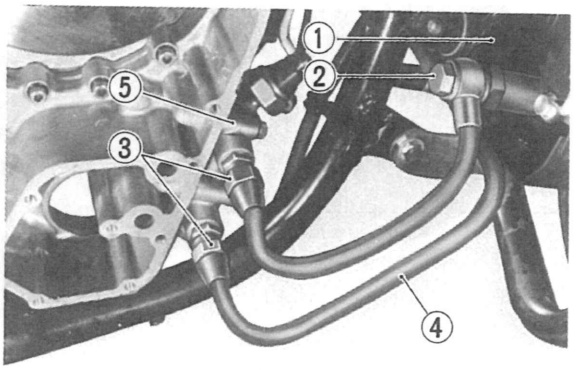

Fig. 3–13 *1. Oil cooler 2. Union bolt 3. Oil pipe nut 4. Oil pipe 5. Oil pressure regulator*

7. Take down the engine and transmission case (both being bolted to the main case). Lift the two slightly to clear the frame when removing them from the machine.
8. Loosen the 11 Allen-head bolts securing the transmission case to the main case. Tap around on the transmission case to loosen it from the main case, and take it off the latter case. Use a plastic hammer. **(Fig. 3-15)**

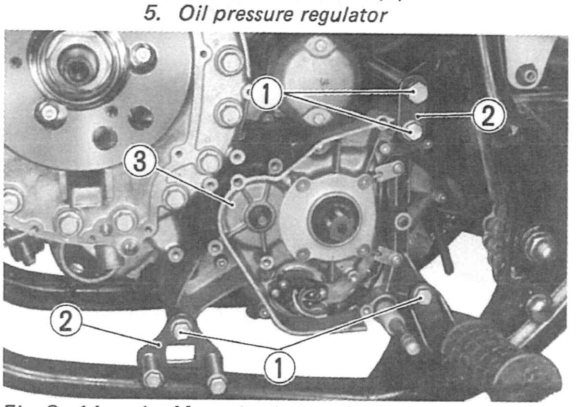

Fig. 3–14 *1. Mounting bolt 2. Mounting plate 3. Transmission case*

9. Pull out the two shift fork shafts from transmission case. This frees the shift forks from gears. Remove the shift cam neutral stopper spring, and take out the stopper. **(Fig. 3-16)**
10. Drive on the clutch-side end of countershaft with the plastic hammer to force this shaft and drive shaft, complete with gears, out of the main case. **(Fig. 3-17)**
11. Draw the shift shaft off main case; remove the four screws securing the shift pawl lifter and shift cam guide; remove the lifter and guide; and pull the gear shift driven gear off the shift cam.

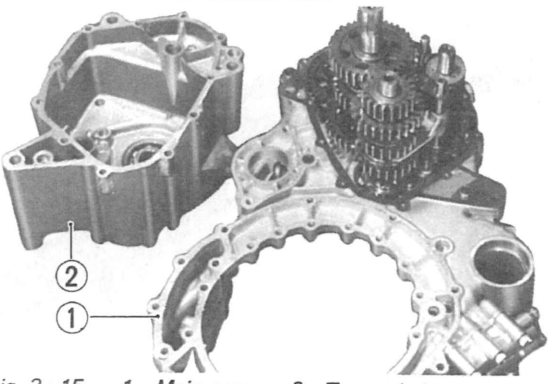

Fig. 3–15 *1. Main case 2. Transmission case*

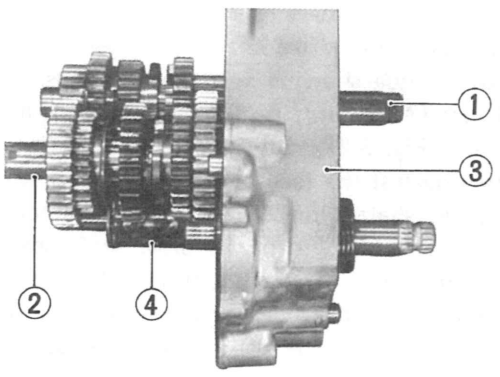

Fig. 3–17 *1. Countershaft 2. Drive shaft 3. Main case 4. Gear shift shaft*

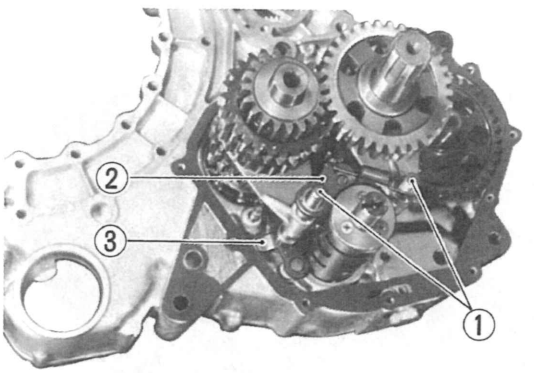

Fig. 3–16 *1. Shift fork shaft 2. Shift cam stopper 3. Shift cam neutral stopper*

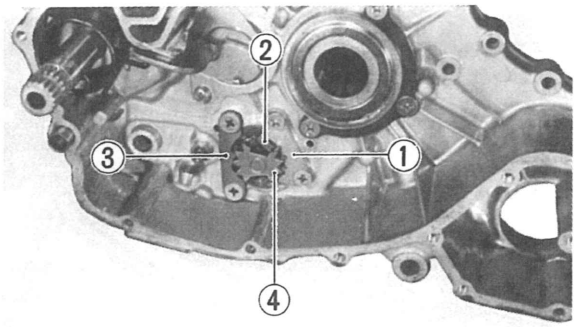

Fig. 3–18 *1. Gear shift cam guide 2. Shift pawl 3. Shift pawl lifter 4. Shift cam driven gear*

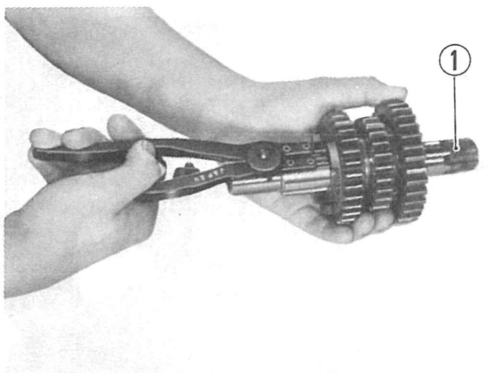

Fig. 3–19 *1. Drive shaft*

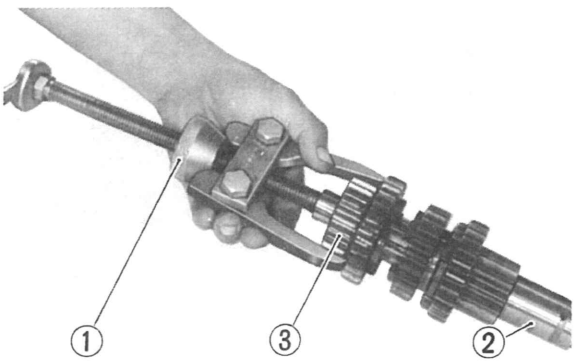

Fig. 3–20 *1. Bearing puller 2. Countershaft 3. 2nd gear*

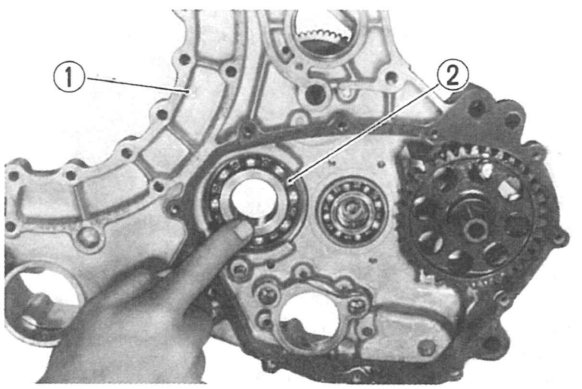

Fig. 3–21 *1. Main case 2. Ball bearing*

12. Remove the shift cam from the main case by drawing it toward the clutch side. **(Fig. 3-18)**
13. Using the **snap ring opener (Tool No. 09920-70111)**, remove the circlip retaining each gear on the drive shaft, and slide each gear off the shaft. **(Fig. 3-19)**
14. When removing the gears mounted on the countershaft, have the 2nd gear removed by using the **bearing puller (Tool No. 09913-60910)**. This gear is press-fitted to the countershaft; its removal allows the 5th and 3rd gears to come off and there will be no difficulty in removing these gears. The 4th gear is retained by a circlip, which is to be removed with the use of the snap ring opener. **(Fig. 3-20)**

c. Inspection

1. Check the ball bearings press-fitted into the main case and transmission case by rotating and spinning each by hand. A bearing that rolls rough or sticks or hitches must be replaced.

   Inspect the needle bearing of gear shift cam for wear of the needle rollers. If the needle rollers are in worn-down condition or if any rollers are unevenly worn to present an oval cross section, replace the bearing. When installing the this bearing, make sure that no rollers are missing. **(Fig. 3-21)**
2. Check the gear backlash when the gears are all in place. The procedure is as follows: First, make sure that the c-to-c distance between countershaft and drive shaft, as measured at the shaft ends showing from the bearings, is **65.0 mm (2.559 in.)**; rig up the dial gauge as shown in **Fig. 3-22,** with its spindle squarely pointed against the face of a teeth of the gear on drive shaft; lock the other gear (on countershaft); and turn the drive shaft gear back and forth. The amount by which the indicating hand of the dial gauge deflects is the backlash. If the gauge reading exceeds the service limit, given below, the parts involved (gears or shafts) must be replaced to the extent necessary for obtaining the standard

backlash.

Standard backlash	0.05 ~ 0.15 mm (0.0019 ~ 0.0059 in.)
Service limit	0.2 mm (0.008 in.)

3. Examine gear dogs and corresponding slots for wear, breakage or any other damage; replace the parts if they are in bad condition.
4. Check the gear-to-shaft clearance by miking the gear bore and shaft diameter. The difference between the two micrometer readings is the clearance, which should be within the limit indicated below; if not, the gear or shaft, or both, must be replaced.

Standard gear-to-shaft clearance (2nd and Low gears on drive shaft; Top and 4th gear on countershaft)	0.03 ~ 0.09 mm (0.0012 ~ 0.0035 in.)
Service limit	0.19 mm (0.0075 in.)

5. Inspect the shift fork shaft for wear, and check it for straightness by placing it on the surface plate and by measuring the clearance, if any, between shaft and plate. A shift fork shaft presenting excessive wear or producing a thickness gauge reading in the above straightness check of a value greather than **0.08 mm (0.0031 in.)** at any portion of its length must be replaced. **(Fig. 3-23)**
6. Mike the fingers of the shift fork, as shown in **Fig. 3-24,** and also the dog of the fork. Replace the shift fork if its finger is worn down beyond **4.9 mm (0.193 in.)** in thickness or if its dog measures less than **5.9 mm (0.232 in.)** in diameter.
7. Check the gear shift cam for wear by miking its diameter. Replace the cam if any of the readings taken is less than **44.70 mm (1.7598 in.). (Fig. 3-25)**
8. Inspect the shift cam spring and the cam neutral stopper spring for any damage, and replace them as necessary.
9. Inspect the oil seals for condition. Be sure to replace oil seals found in bad condition.

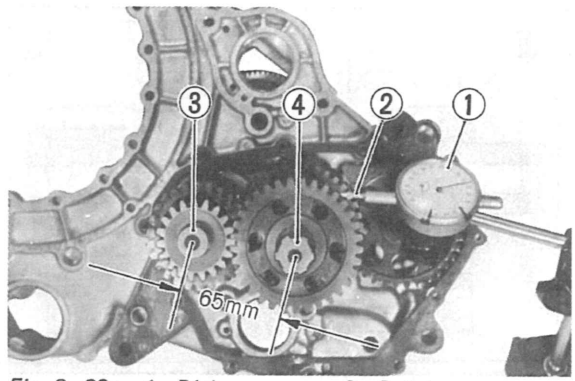

Fig. 3–22 *1. Dial gauge* *2. Pointer* *3. Countershaft* *4. Drive shaft*

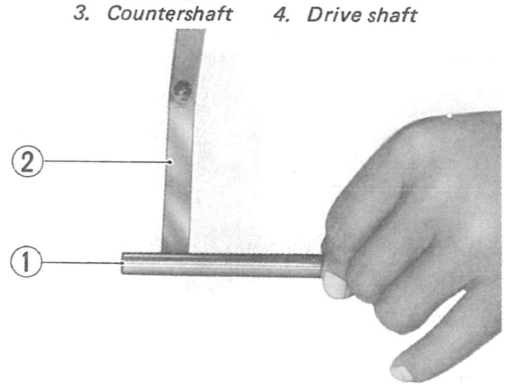

Fig. 3–23 *1. Shift fork shaft* *2. Thickness gauge*

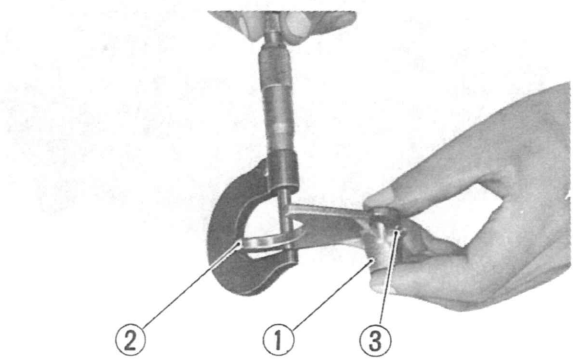

Fig. 3–24 *1. Shift fork* *2. Finger* *3. Dog*

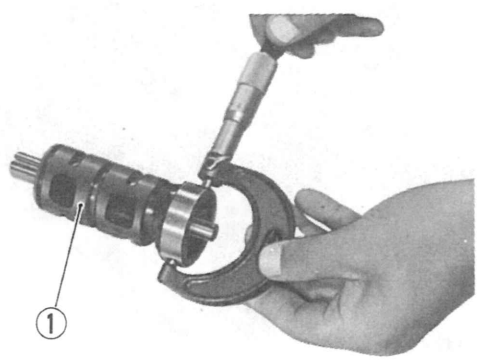

Fig. 3–25 *1. Gear shift cam*

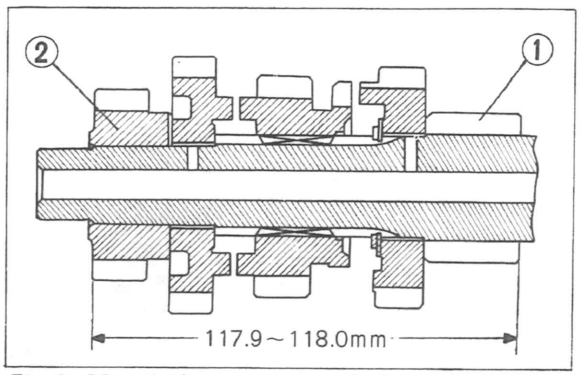

Fig. 3–26 1. Low gear 2. 2nd gear

Fig. 3–27

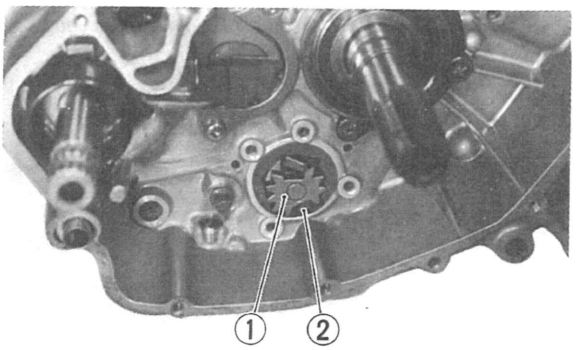

Fig. 3–28 1. Gear shift cam driven gear 2. Pawl

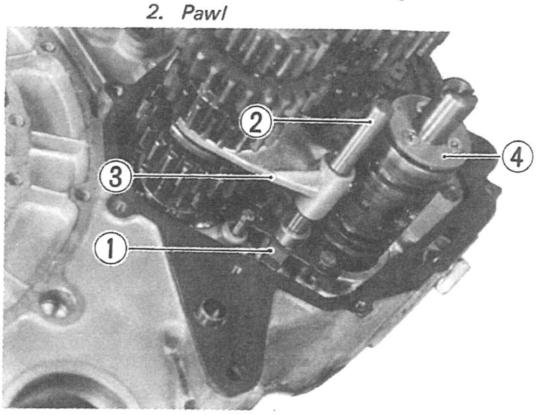

Fig. 3–29 1. Gear shift cam neutral stopper 2. Shift fork shaft 3. Shift fork 4. Gear shift cam

d. Reassembly

1. Wash all removed parts and dry them with compressed air.
2. Press-fit 2nd gear to countershaft in a press machine, as follows:
   (1) Apply **SUZUKI LOCK SUPER "103K" (Part No. 99000-32030)** – a thread lock cement – to the bore of 2nd gear.**(Fig. 3-26)**
   Note: Never apply the cement to the countershaft. Remember, Top gear on the inner side is meant to be rotatable on the shaft.
   (2) Press 2nd gear to home until it touches Top gear already in place. Be sure to hold the press arbor, gear, countershaft and all accurately trued up when giving the push. With 2nd gear press-fitted, make sure Top gear is capable of rotating on the shaft.
   Note: Wipe off the oozed-out cement, if any; and check to be sure the face-to-face distance between 2nd gear and Low gear is anywhere between 117.9 and 118.0 mm (4.642 ~ 4.646 in.).
3. When attaching shift cam stopper plate to gear shift cam, be sure to align the round dent mark (on the plate surface) to the two oil openings of the cam in the axial direction, as shown in **Fig. 3-27,** before securing the plate to the cam by driving in the three screws, whose threads have been coated with the thread lock cement mentioned above.
4. When placing the countershaft and drive shaft, each complete with its gears, in the main case, be sure to have the gears in neutral positions, which are illustrated in **Fig. 3-9A.**
5. The gear shift cam is to be installed in the following sequence: First, insert the cam into main case; mount shift pawls, pins and springs on the gear shift driven gear; and attach the gear to the cam. **(Fig. 3-28)**
   Note: Apply the thread lock cement to the screws.
6. Hook the spring (shift cam neutral stopper spring) onto the pin studded in the main case; align the hole of shift cam neutral stopper to the hole into which the shift fork shaft is to enter; engage the gear shift fork with 3rd gear in place on countershaft, fitting the fork fingers properly into the groove; and insert the dog of the fork into the middle groove of the shift cam. To allow the dog to enter the

groove, the cam may have to be turned one way or the other in order to make the cam take its neutral position. Pass the fork shaft through the shift fork and cam neutral stopper and through the holes provided in the main case, and then mount the shift cam stopper on the shaft. **(Fig. 3-29)**

7. The next step is to install the two identically-shaped shift forks, No. 1 and No. 2. Fit their fingers to Top gear and 4th gear on drive shaft, letting the dog of each fork fall into its groove in the cam. Hook the shift cam stopper spring onto the shift fork shaft, and pass the shaft through the two forks and through the holes provided in the main case. **(Fig. 3-30)**
8. Put on the transmission case over the gears in place, and secure the case to the main case by driving in a total of 11 Allen-head bolts. Tighten these bolts to a torque of **80** to **90 kg-cm (6.0 ~ 6.6 ft-lb). (Fig. 3-31)**
9. Mount the rotary engine unit and transmission case assembly on the frame. Tighten the mounting bolts to these torque values:
   250 ~ 400 kg-cm (18 ~ 29 ft-lb)
   for 10-mm bolts
   130 ~ 230 kg-cm (9.5 ~ 17 ft-lb)
   for 8-mm bolts
10. For the steps to be hereafter taken, refer to **2-2, page 15** to **17.**

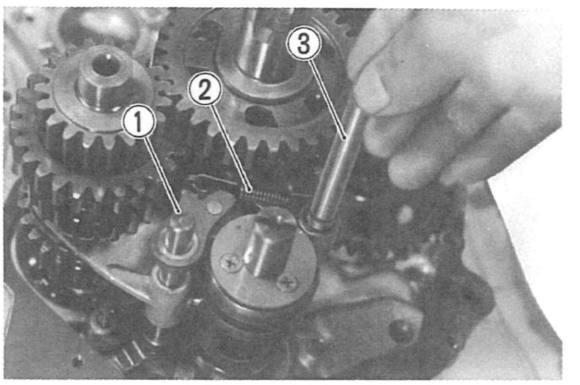

Fig. 3–30 1. Gear shift cam stopper 2. Spring 3. Shift fork shaft

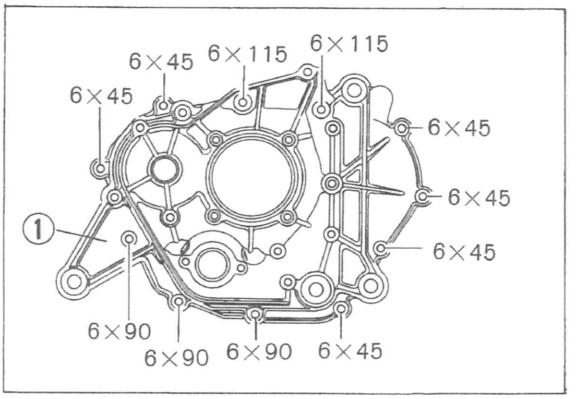

Fig. 3–31 1. Transmission case

COOLING SYSTEM

GROUP 4

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4-1. GENERAL DESCRIPTION

DESCRIPTION

Engine cooling is accomplished by two media – cooling water for cooling two side housings and one rotor housing and engine oil for cooling the interior of the rotor.

The scheme of rotor cooling is illustrated in **Fig. 4-1.** Engine oil is pressure-fed into the eccentric shaft, from which it flows into the rotor. The details of this scheme are described in **group 5. Engine lubrication system.**

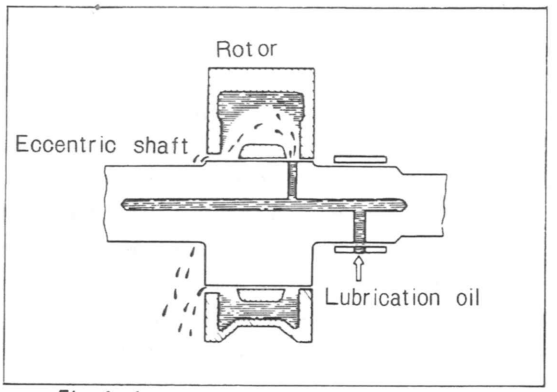

Fig. 4–1

Water is forced into the shell parts of the engine, that is, to the three housings; it flows in such a way as to minimize the temperature gradient by removing more heat from hot spots. The thermostat in the suction line of the water pump controls the rate of water circulation through the radiator.

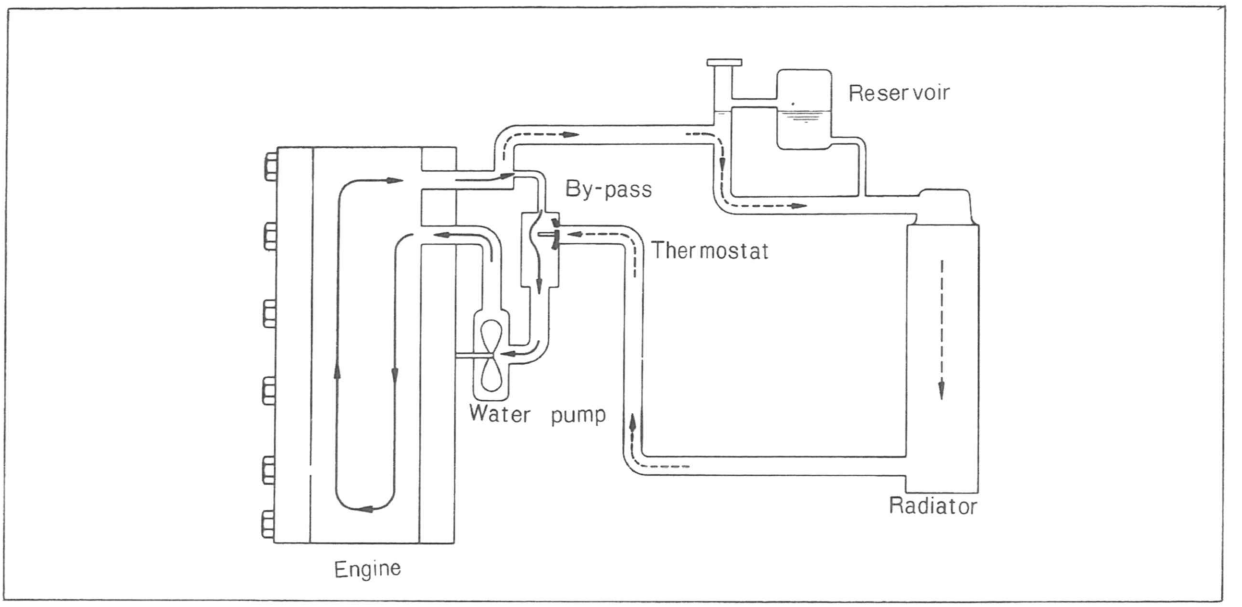

Fig. 4–2 Thermostat closed

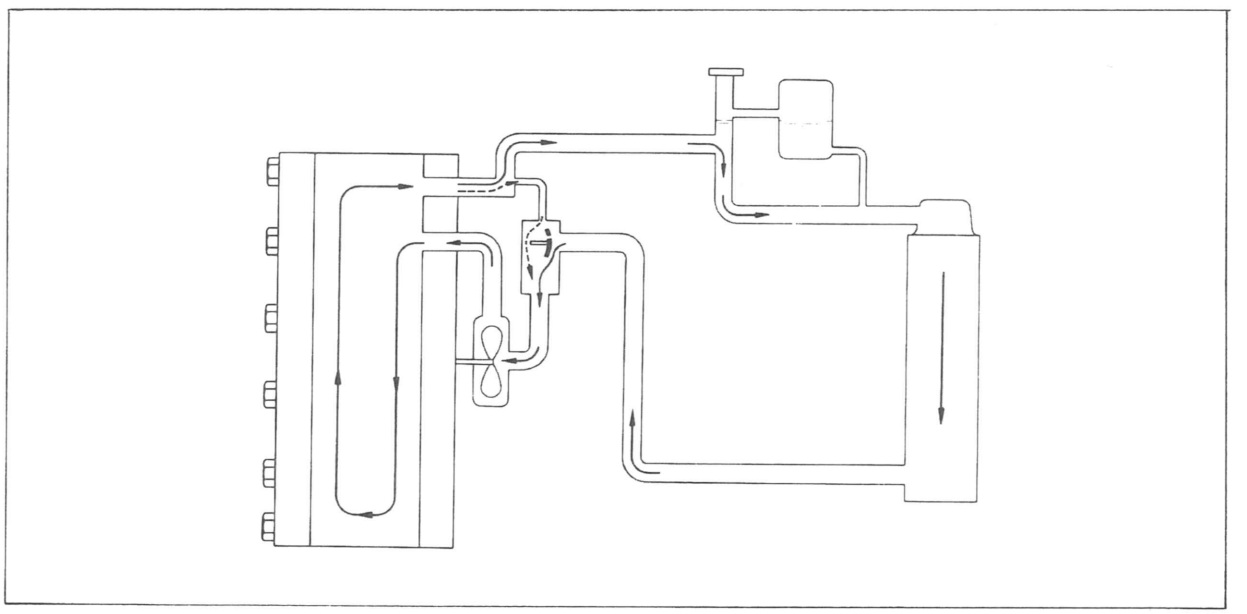

Fig. 4–3 Thermostat opened

Referring to **Fig. 4-2**, the thermostat is in closed condition, so that water recirculates through the route comprising pump, engine and bypass passage. The engine is heating the water, so to say, and a small water flow exists through the radiator to introduce cold water to the back of the thermostat valve. This flow is due to an orifice provided in the valve, and is calculated to avoid an inrush of cold water from the front side toward the temperature sensing part of the walve when it opens.

As the temperature rises and the thermostat valve unseats to cut in the radiator, the water begins to flow through the radiator. **(Fig. 4-3)**. The bypass passage, mentioned above, serves to bleed out air bubbles, if any, that may have developed in the circuit, when the normal water flow is established through the radiator.

SPECIFICATIONS

Cooling system water capacity	4.5 litres (1.2/1.0 US/Imp. gal.)
Thermostat: Starts to open at –	71 ± 2°C(159.8 ± 3.6° F) of rising temperature
Becomes fully closed at –	68.5 ± 2°C(155 ± 3.6° F) of falling temperature
Valve lift	8 mm minimum at 85° C (185° F)

TROUBLE-SHOOTING

Symptom	Probable cause	Remedy
Engine overheats	1. Not enough cooling water	Add
	2. Radiator core is clogged with dirt or trashes	Clean
	3. Erratic thermostat, stuck in closed position	Replace
	4. Faulty cooling fan	Repair or replace
	5. Defective thermo switch	Replace
	6. Clogged water passage	Clean
	7. Air trapped in the cooling circuit	Bleed out air
Engine overcools	1. Erratic thermostat, stuck in full-open position	Replace
	2. Defective thermo switch	Replace
	3. Extremely cold weather	Put on the radiator cover

4-2. RADIATOR AND WATER HOSES

a. Description

The radiator is of fin-and-tube type, aluminum in material, and is characterized by lightness in weight and good heat dissipation. A reservoir tank is provided outside the radiator to accommodate water from the radiator when the cooling water volume expands due to a temperature rise.

b. Removal

1. Take down the fuel tank, the method of which is explained in **2-2 (a), 1 through 5, page 9.**

2. Remove radiator bumper. The humber is secured in place by 4 bolts. Removing these bolts permits bumper to come off. **(Fig. 4-4)**

3. Unscrew union bolts at both sides of the oil cooler. **(Fig. 4-5)**

   Note: As the union bolts are unscrewed, oil will drip out of the joint. Catch the leaking oil by a proper receptacle.

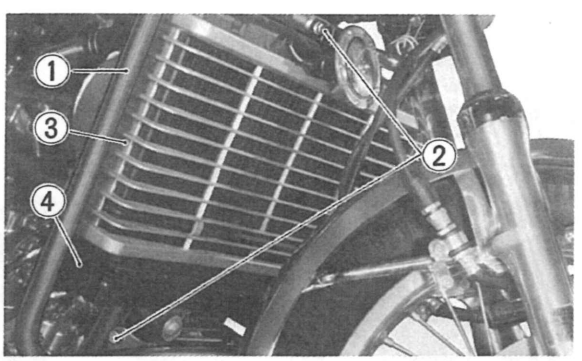

Fig. 4–4 *1. Radiator bumper* *2. Bumper bolt* *3. Radiator* *4. Oil cooler*

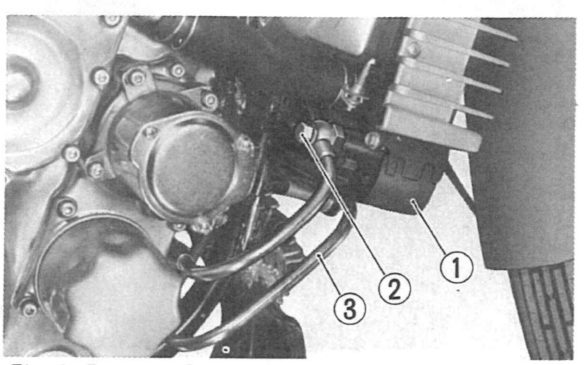

Fig. 4–5 *1. Oil cooler* *2. Union bolt* *3. Oil pipe*

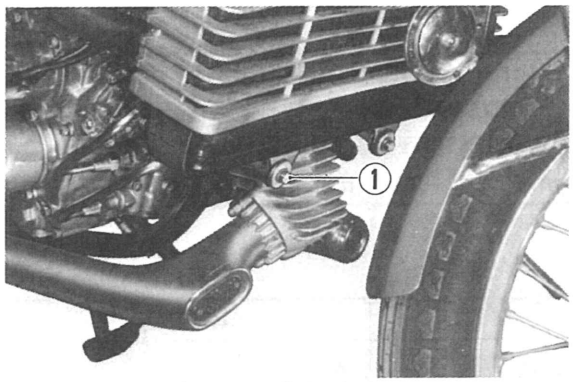

Fig. 4–6 1. Oil cooler fixing bolt

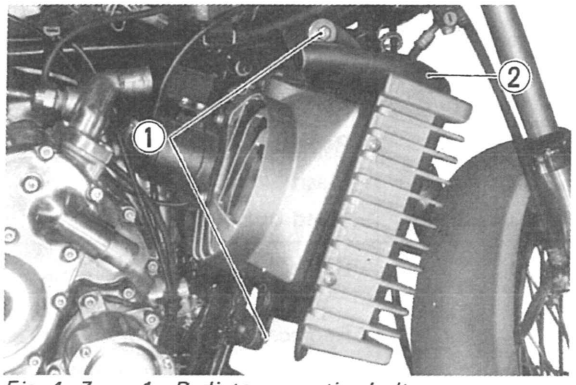

Fig. 4–7 1. Radiator mounting bolt
2. Radiator

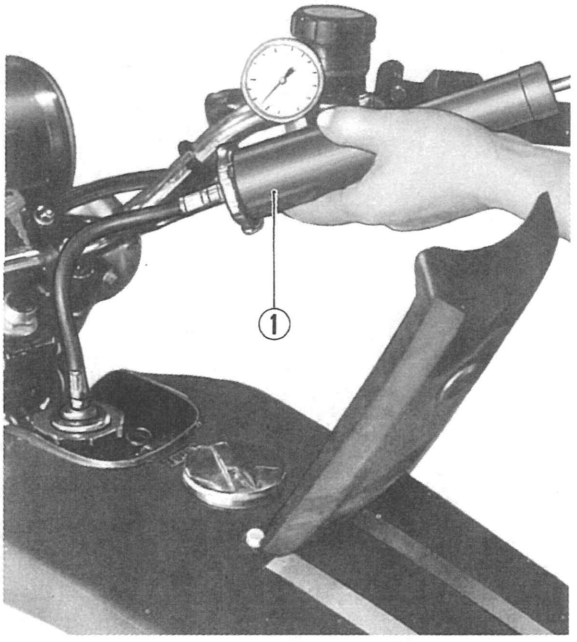

Fig. 4–8 1. Radiator tester

4. Remove the 4 bolts securing the oil cooler, and take down the cooler. **(Fig. 4-6)**
5. Remove the radiator cap. Loosen drain plug to drain the radiator.
6. Disconnect water hoses from the radiator.
7. Detach the front stopper for fuel tank. Remove 4 bolts securing the radiator in place. Take out the radiator. **(Fig. 4-7)**
8. Remove the 4 screws fastening the cover to the radiator, and separate cover from radiator.

c. Inspection

1. Test the cooling system for tightness by using the radiator tester as follows:
Remove the radiator cap, and connect the tester to the filler. Give a pressure of about **1 kg/cm^2 (12.9 psi)** and see if the system holds this pressure for 10 seconds. If the pressure should fall during this 10-second interval, it means that there is a leaking point in the system; in such a case, inspect the entire system and replace the leaking component or part. **(Fig. 4-8)**
2. Test the radiator cap for relieving pressure by using the radiator tester in the following manner: Fit the cap to the tester, as shown, and build up pressure slowly by operating the tester. Make sure that the pressure build-up stops at **0.9 ± 0.1 kg/cm^2 (12.78 ± 1.4 psi)** and that, with the tester held standstill, the cap is capable of that pressure for at least 10 seconds. Replace the cap if it is found not to satisfy either of these two requirements. **(Fig. 4-9)**

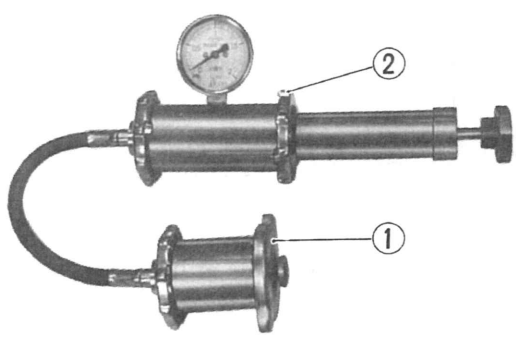

Fig. 4–9 1. Radiater cap 2. Radiator tester

3. Road dirt or trashes stuck to the fins must be removed. Use of compressed air is recommended for this cleaning. Fins bent down or dented can be repaired by straightening them with the blade of a small screwdriver. **(Fig. 4-10)**
4. Any water hose found in cracked condition or flattened must be replaced.

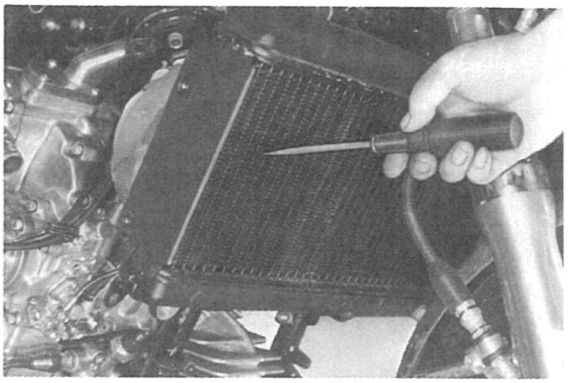

Fig. 4–10

d. Installation

The radiator is to be installing the removal procedure. After installing the radiator, be sure to add engine oil and cooling water: refer to **GROUP 16-2, 1, 15** for refilling infomation.

4-3. THERMOSTAT

a. Description

The thermostat is of wax pellet type, complete with a valve as the means of temperature-dependent control over the flow of water through the radiator. The valve is actuated by the temperature-sensitive wax contained in the pellet. **(Fig. 4-11)**

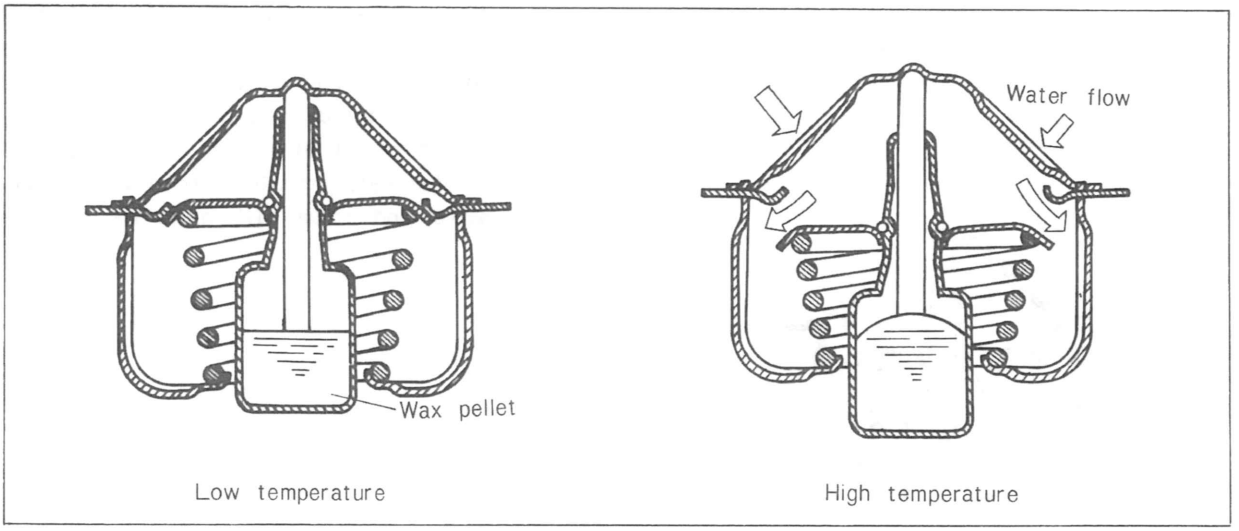

Fig. 4–11 Thermostat

b. Removal

1. Remove the water pump case. This case is secured by a total of 12 Allen-head bolts. **(Fig. 4-12)**

   Note: Be sure that the engine is cold. Have a proper receptacle ready to catch the cooling water which will leak out as the case is loosened.
2. Take the thermostat out of the clutch cover.

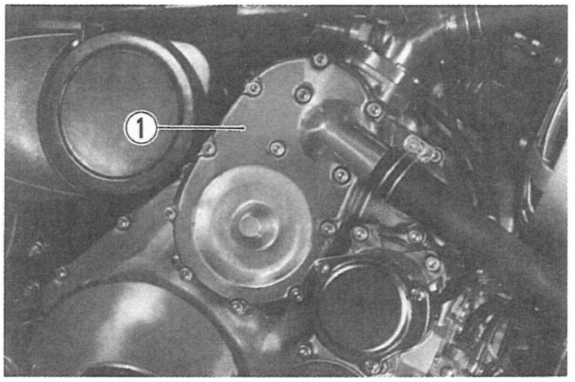

Fig. 4–12 1. Water pump case

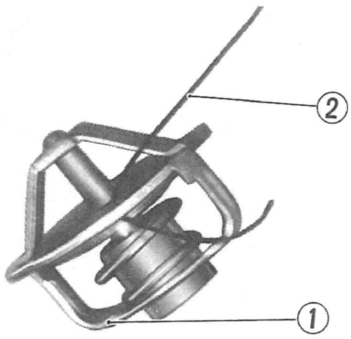

Fig. 4–13 1. Thermostat 2. Fine thread

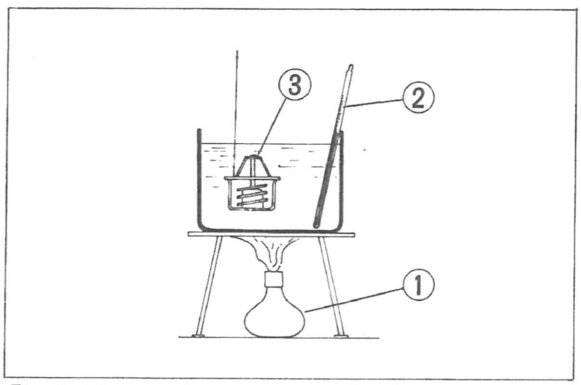

Fig. 4–14 1. Stove 2. Thermometer 3. Thermostat

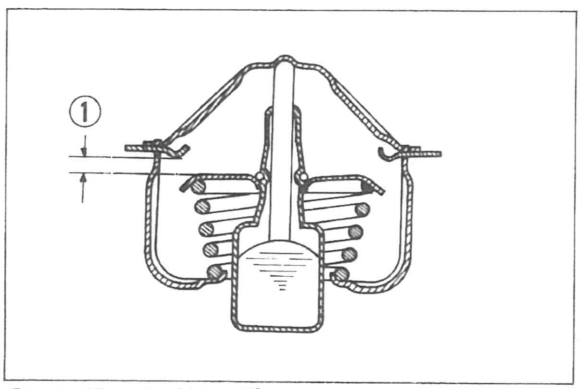

Fig. 4–15 1. Valve lift

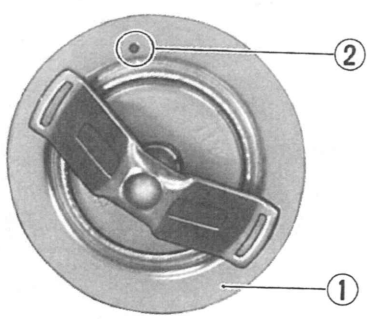

Fig. 4–16 1. Thermostat 2. Air bleed hole

c. Inspection

1. Inspect the thermostat pellet for signs of cracking.
2. Test the thermostat at the bench for control action, in the following manner:

   Pass a fine thread between valve and seat, as shown in **Fig. 4-13.** Immerse the thermostat in the water contained in a jar, as shown in **Fig. 4-14.** Note that the immersed thermostat is in suspension. Heat the water by placing the jar on a stove and observe the rising temperature on the thermometer.

   Read the thermometer just when the thermostat drops to the bottom of the jar. This reading, which is the temperature level at which the thermostat valve begins to open, should be anywhere between **69°** and **73°C (156° ~ 164°F).**

   Keep on heating the water to raise its temperature to and beyond **85°C (188°F).** Just when the water reaches 85°C, the thermostat valve should have lifted by at least **8 mm (0.31 in.).** See **Fig. 4-15.**

   A thermostat failing to satisfy either of the two requirements (start-to-open temperature and valve lift) must be replaced.

d. Installation

The thermostat is to be installed by reversing the removal procedure. Be sure to position the thermostat in the correct direction in place and to bring its air bleed hole to the top side. **(Fig. 4-16)**

After restoring the thermostat, be sure to refill the cooling system up to level.

4-4. WATER PUMP

a. Description

A centrifugal pump with six-blade impeller is used to set the cooling water in recirculation. The impeller is driven from eccentric shaft through a gear train in which the gear ratio is 20 (teeth of timing gear on eccentric shaft) to 25 (teeth of oil pump driven gear). **(Fig. 4-17)**

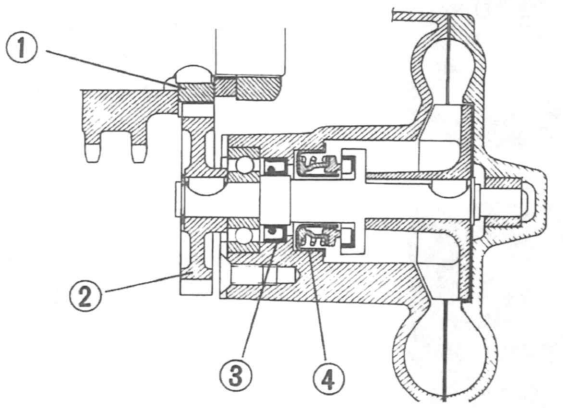

Fig. 4–17 1. Timing drive gear 2. Water pump driven gear 3. Oil seal 4. Water seal

In **Fig. 4-17**, it will be seen that the shaft of water pump has its one end in contact with cooling water and other end exposed to transmission oil. The seals on the shaft, which separate the two incompatible regions, bear great importance because their failure not only adulterates the cooling water but also fouls up the lubricated parts of the transmission and the engine as well, to result in costly damage. So that the condition of the two seals can be detected, a hole is provided in the lower section of that part of the clutch cover where the pump impeller is located. This hole extends to the area between the two seals. Oil leaking from this hole means that the oil seal is in bad condition; by the same token, leaking water means that the water seal has failed.

In other words, the hole is a tell-tale device; the liquid, if any, coming out of this hole tells a very important story. **(Fig. 4-18)**

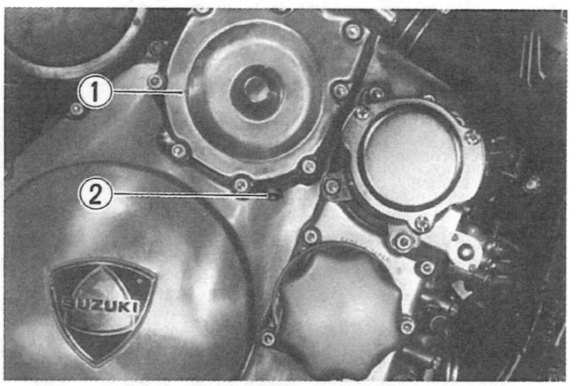

Fig. 4–18 1. Water pump cover 2. Tell-tale hole for seals

b. Disassembly

1. Remove the clutch cover, as described in **GROUP 2.** Refer to **pages 9 to 15.**
2. Remove water pump case. **(Fig. 4-12)**
3. Using the **snap ring opener (Tool No. 09920-70111)**, remove the circlip retaining the impeller. Draw impeller off water pump shaft. **(Fig. 4-19)**

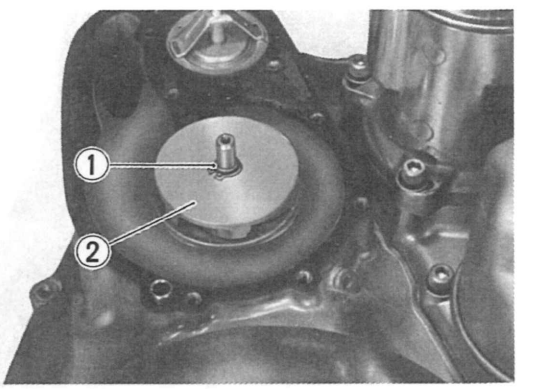

Fig. 4–19 1. Circlip 2. Water pump impeller

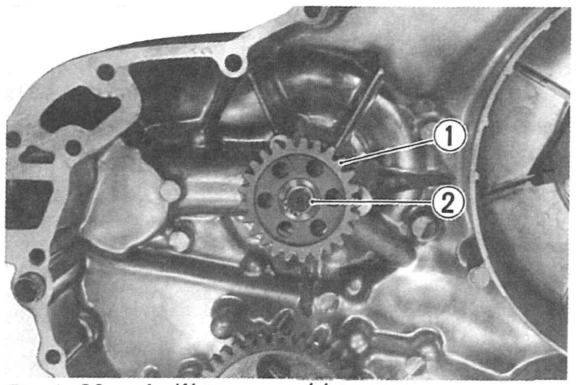

Fig. 4–20 1. Water pump driven gear
2. Circlip

4. Using the same snap ring opener, remove the circlip retaining oil pump driven gear, and draw the gear off. **(Fig. 4-20)**

5. Pry off woodruff key.
6. Draw water pump shaft out toward the front side of clutch cover. **(Fig. 4-21)**

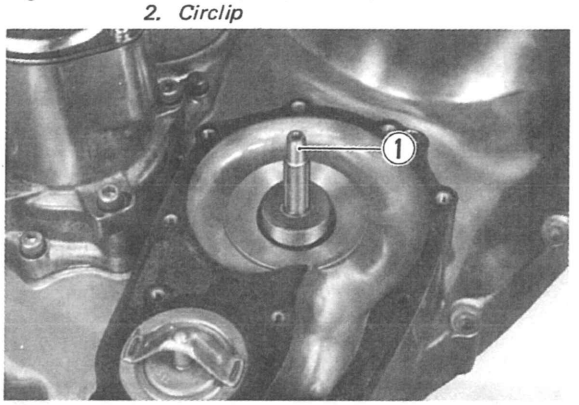

Fig. 4–21 1. Water pump shaft

7. Remove the 2 screws securing the water pump shaft bearing holder, and detach the holder.
8. Take off the bearing and oil seal. **(Fig. 4-22)**

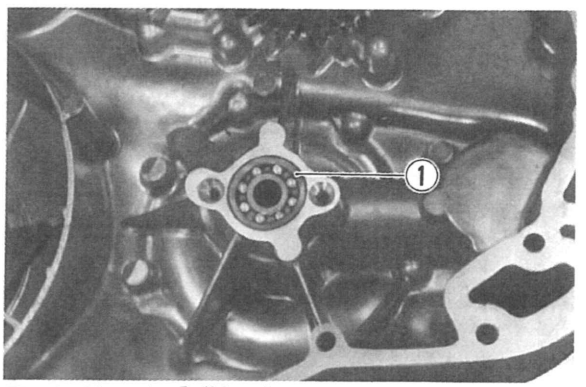

Fig. 4–22 1. Ball bearing

9. From the front side of clutch cover, remove the water pump shaft seal unit. **(Fig. 4-23)**

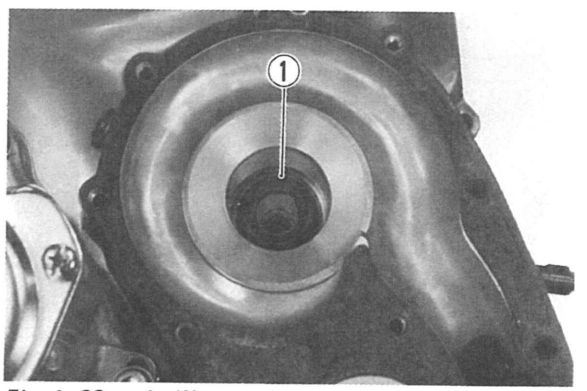

Fig. 4–23 1. Water seal unit

c. Inspection

1. If any sign of oil leakage or water leakage is noted at the tell-tale hole, **Fig. 4-18,** replace the oil seal or the water pump shaft seal unit.
2. Check the water pump shaft for runout, as shown in **Fig. 4-24,** and, if a runout greater than **0.10 mm (0.004 in.)** is noted, replace the shaft.

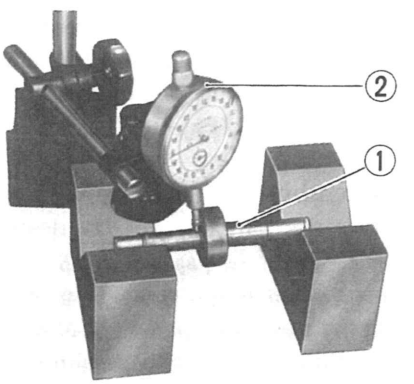

Fig. 4–24 1. Water pump shaft
2. Dail gauge

d. Reassembly

Be sure to adhere to the following instructions:

(a) Use the **water seal installer (Tool No. 09914-73710)** to fit the water pump shaft seal unit into the clutch cover. Before fitting the unit, be sure to coat its seating face (mating with the clutch cover) with **SUZUKI BOND No. 4 (Part No. 99000-31030). (Fig. 4-25)**

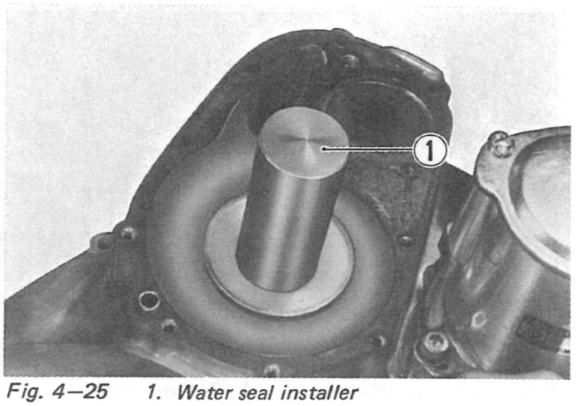

Fig. 4–25 1. Water seal installer

(b) Use the **oil seal installer No. 2 (Tool No. 09914-73730)** to fit the water pump shaft oil seal by driving into the clutch cover. This seal goes into the off side of the cover. **(Fig. 4-26)**

(c) The ball bearing goes in first, the pump shaft next, followed by driven gear and impeller. Be sure to retain them securely with circlips.

(d) Refer to **GROUP 2, pages 15 ~ 16**, for the correct procedure of assembling the clutch cover.

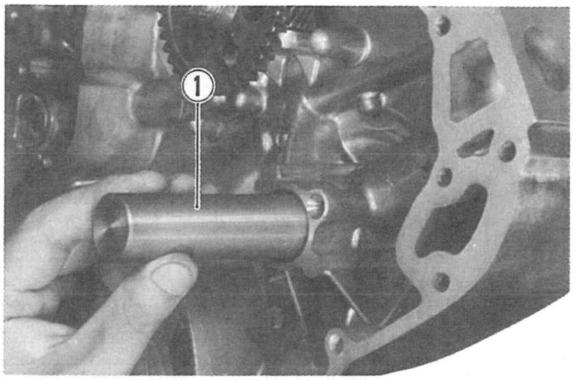

Fig. 4–26 1. Oil seal installer No. 2

4-5. THERMOMETER, THERMO SENSER AND VOLTAGE REGULATOR

a. Description

The circuit diagram of **Fig. 4-27** shows the electrical wiring for the thermometer. The major components are: thermo senser in contact with cooling water; voltage regulator which compensates for changes in battery voltage to secure constant 7 volts; and temperature indicator (thermometer).

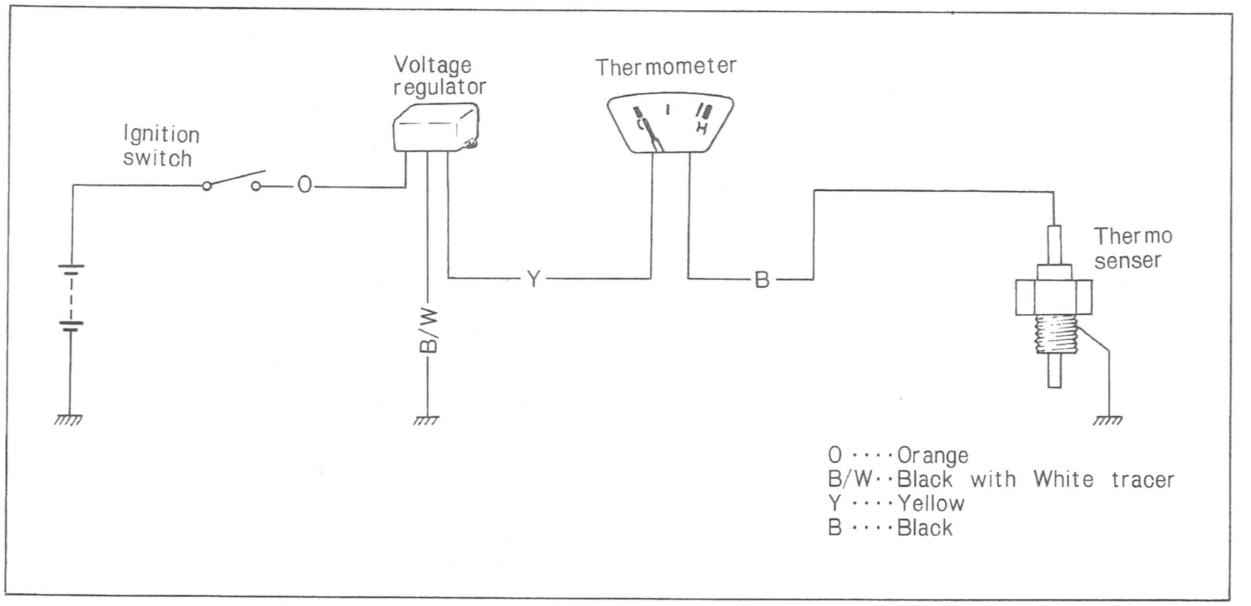

Fig. 4–27

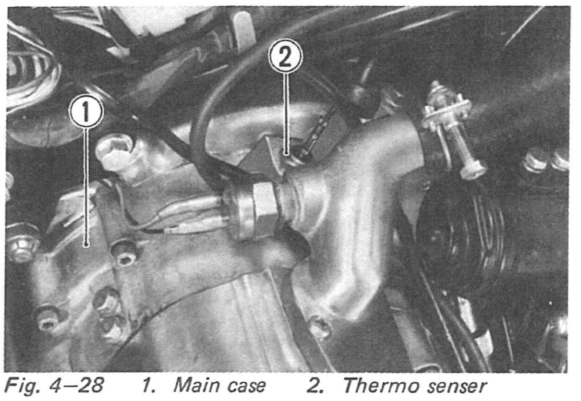

Fig. 4–28 1. Main case 2. Thermo senser

b. Removal

1. Disconnect black lead wire from thermo senser on the main case. With a wrench, loosen thermo senser and remove it from the main case. **(Fig. 4-28)**

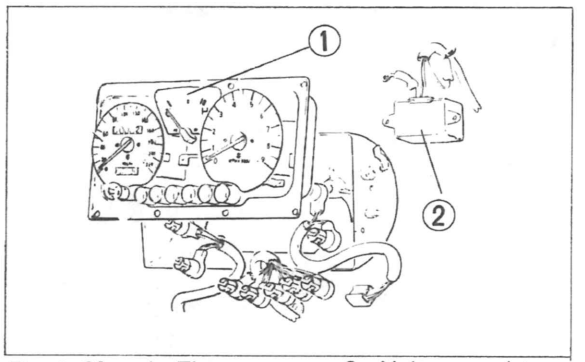

Fig. 4–29 1. Thermometer 2. Voltage regulater

2. Remove the speedometer-tachometer combination as outlined in **GROUP 15, page 137.**
3. Disassemble the speedometer-tachometer combination as shown in **Fig. 4-29.**

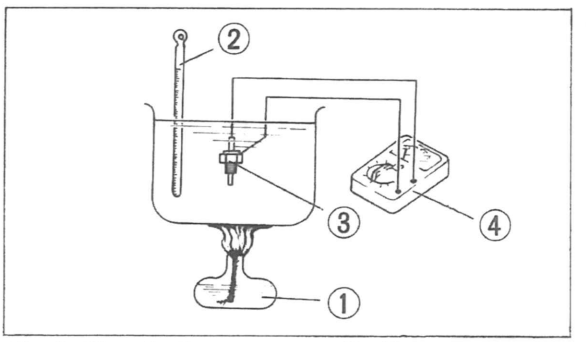

Fig. 4–30 1. Stove 2. Thermometer 3. Thermo senser 4. Ohmmeter

c. Inspection

1. Test the thermo senser at the bench to see if its ohmic value changes, as specified with, temperature. The test is to be run as follows: Connect the senser to the ohmmeter and place it in the water contained in a jar, which is placed on a stove; heat the water to raise its temperature slowly, reading the thermometer placed in the jar and also the ohmmeter. A senser whose ohmic value does not change in the proportion indicated below must be replaced. **(Fig. 4-30)**

Temperature	88°C (190°F)	110°C (230°F)
Resistance	39.5 ± 5.5 ohms	210 ± 5 ohms

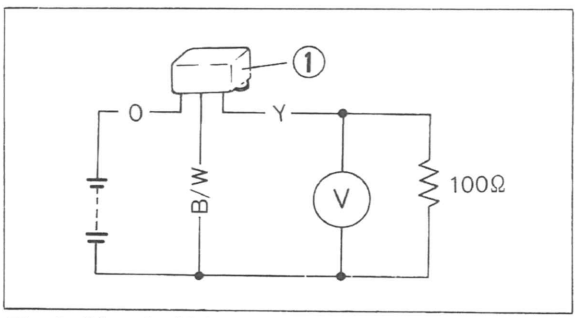

Fig. 4–31 1. Voltage regulator

2. Test the voltage regulator in a test circuit hooked up as shown in **Fig. 4-31.** With a 12-volt battery and a 100-ohm resistor, the potential of the regulator terminal (from which current flows to the indicator) relative to the ground should be **7.0 ± 0.1 volts;** if not, replace the regulator.

Caution: Be careful not to touch the negative (–) terminal of the regulator with the positive lead wire extending from the

battery, or the semi-conductor elements inside may get ruptured beyond repair.

3. Test the thermometer with a variable resistor (variable up to 200 ohms), an ammeter and a voltmeter, arranged as shown in **Fig. 4-32,** in order to check its calibration at the center of its scale. The method is as follows: Bring the indicating hand to the scale center (88°C), as shown in **Fig. 4-33,** by adjusting the variable resistor; read the ammeter and voltmeter; and determine from the two readings the ohmic value of the resistor. This value (= voltmeter reading in volts divided by ammeter reading in amperes) should be **39.5 ± 5.5 ohms.**

d. Installation

The installing precedure is the reverse of the removal.

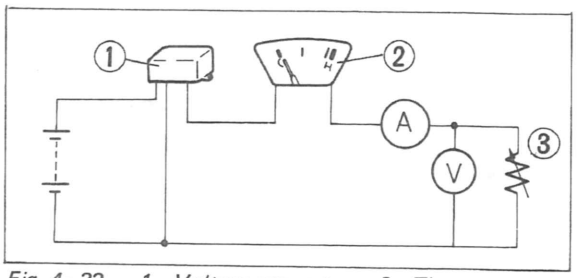

Fig. 4–32 *1. Voltage regurator 2. Thermometer 3. Variable resistor*

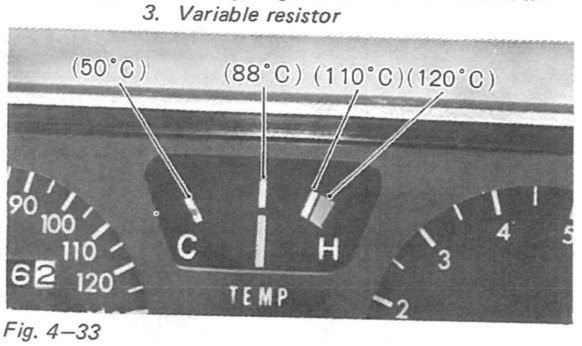

Fig. 4–33

4-6. COOLING FAN AND THERMO SWITCH

a. Description

The cooling fan, located to the right of the radiator, is secured to the frame by two bolts. The fan drive motor is automatically controlled by the thermo switch. This switch remains open when the temperature of cooling water is low, but opens at about 106°C (223°F) of rising water temperature to set the fan in motion. **(Fig. 4-34)**

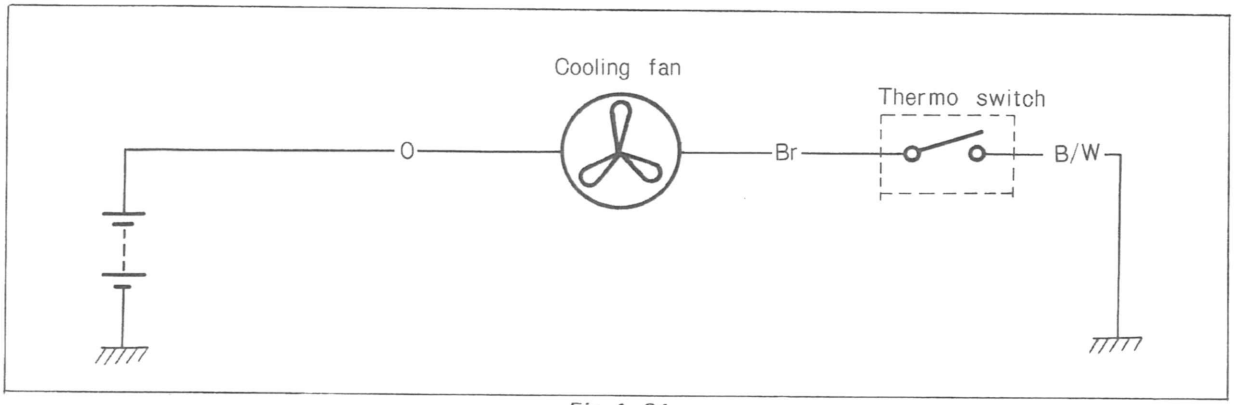

Fig. 4–34

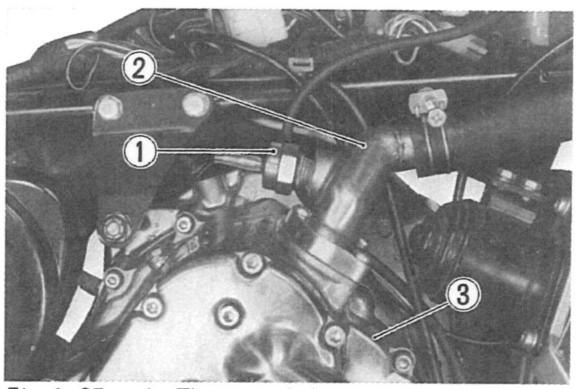

Fig. 4–35 *1. Thermo switch 2. Water hose connector 3. Clutch cover*

b. Removal

1. Take down the fuel tank. The procedure is outlined in **GROUP 2, page 9.**
2. Pull out the lead wire from the water hose connector on the clutch cover and loosen the switch. **(Fig. 4-35)**
3. Disconnect the lead wire (extending from the cooling fan) from the multi-lead connector.
4. Remove the two mounting bolts, and take down the cooling fan.

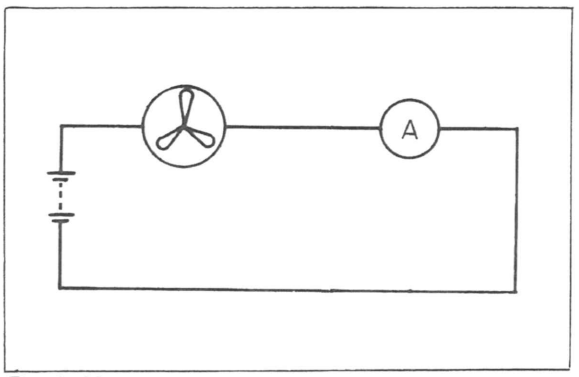

Fig. 4–36

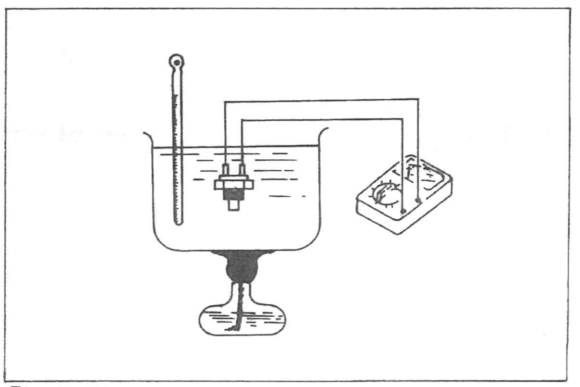

Fig. 4–37

c. Inspection

1. Test the cooling fan drive motor for load current with a voltmeter and an ammeter connected as shown in **Fig. 4-36.** The voltmeter is for making sure that the battery applies 12 volts to the motor. With the motor running at full speed, the ammeter should be indicating not more than **4 amperes.**
2. The thermo switch must be checked for its temperature-initiated closing action at the specification value of **106 ± 3°C (222.8 ± 5.4°F)** by testing it at the bench as shown in **Fig. 4-37.** Connect the switch to a circuit tester and raise the temperature of the water in the jar, and read the column thermometer when the switch closes.

d. Installation

Simply reverse the removal procedure to install the cooling fan and switch. Before installing the thermo switch, be sure to apply **SUZUKI BOND No. 4 (Part No. 99000-31030)** to the threaded portion of the switch.

LUBRICATION SYSTEM

GROUP 5

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5-1. GENERAL DESCRIPTION

DESCRIPTION

The oil pump lifts oil in the engine oil sump and delivers it against pressure through the oil filter. From this filter, the oil proceeds through the cooler and enters the R.E. proper.

As the engine picks up speed in operation, the oil pressure in the pump discharge line rises. In order to limit this pressure rise, a pressure regulator is provided between pump and filter. The oil bled out by the regulator flows right back to the oil sump. During normal operation, the engine is supplied with lube oil at a constant pressure.

Oil filter and cooler are each equipped with a relief valve. In the event of a clogged filter or cooler, the relief valve operates to allow the oil to bypass the filter or cooler. This feature assures the uninterrupted supply of lube oil to protect the R.E. against seizure in such an unlikely, though possible, event.

Within the engine, the oil lubricates the running fit of the rotor on the eccnetric shaft and also the rotor rotating gears; it lubricates also the bearings of the eccentric shaft.

The gas seals – apex seals, corner seals and side seals – too need lubrication because they are in sliding contact. This requirement is met by injecting lube oil into the carburetor; the oil comes from another oil tank and is fed to the carburetor by a metering oil pump. This lubrication scheme constitutes an independent system distinct from the main system described above.

In the carburetor, the oil mixes with the fuel and is carried by the fuel-air mixture into the intake port. The metering oil pump is associated with throttle control and delivers oil in proportion to the throttle position. When the engine is in full-load operation, the throttle valve will be wide open and the metering oil pump will be delivering at a full rate to meet the requirement for the gas seals. **(Fig. 5-1)**

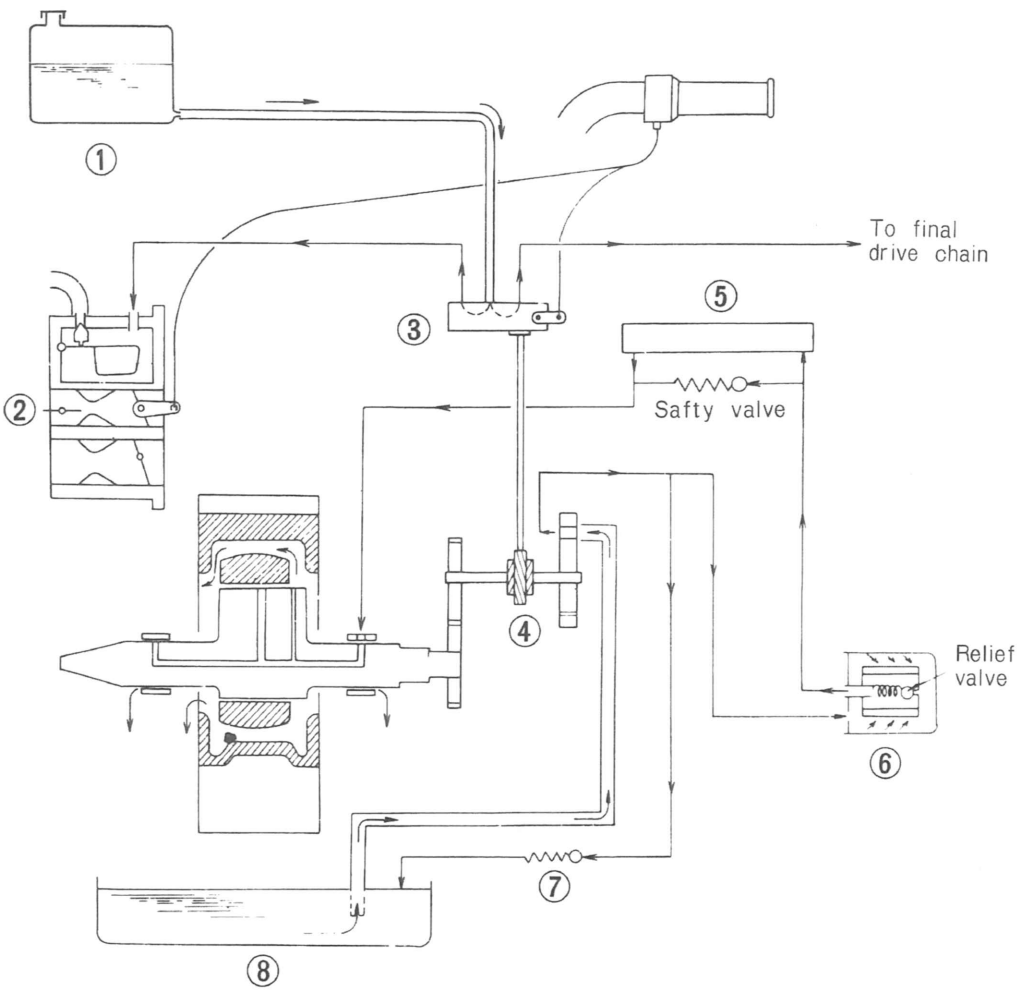

Fig. 5–1 *1. Metering oil tank* *2. Carburetor* *3. Metering oil pump* *4. Oil pump* *5. Oil cooler* *6. Oil filter* *7. Pressure regulator* *8. Oil sump*

SPECIFICATIONS

Item	Standard	Service limit
OIL PUMP:		
Tip clearance	0.04 ~ 0.14 mm (0.0016 ~ 0.0055 in.)	0.20 mm (0.0079 in.)
Outer rotor-to-body clearance	0.05 ~ 0.115 mm (0.0020 ~ 0.0045 in.)	0.15 mm (0.0059 in.)
Side clearance	0.005 ~ 0.09 mm (0.0002 ~ 0.0035 in.)	0.11 mm (0.0043 in.)
PRESSURE REGULATOR:		
Spring length (regulator side)	58.2 mm (2.291 in.)	53.5 mm (2.106 in.)
Spring length (oil-cooler safety valve side)	47.3 mm (1.862 in.)	43.0 mm (1.693 in.)
OIL PRESSURE SWITCH:		
Operating pressure	0.2 ~ 0.3 kg/cm^2 (2.8 ~ 4.3 psi)	———
METERING OIL PUMP:		
Delivery rate at normal operating temperature (with lever in full-open position)	5.0 ± 0.5 cc in 6 minutes	———

TROUBLE-SHOOTING

Symptom	Probable cause	Remedy
Oil pressure indicator lamp remains burning	1. Defective oil pressure switch	Replace
	2. Broken oil pump shaft	Replace the shaft
	3. Not enough oil in the oil sump	Replenish
Oil leakage	1. Bolts are not tight enough	Retighten
	2. Ruptured gasket	Replace
	3. Pressure regulator setting too high	Check adjusting parts and repair or replace them if found defective
Engine overheats	1. Not enough engine oil	Replenish
	2. Defective oil pump	Replace
	3. Metering oil pump is out of adjustment or defective	Adjust or replace
	4. Pressure regulator setting too low or erratic	Check adjusting parts and repair or replace them if found defective
	5. Clogged oil passage	Clean and clear
	6. Oil cooler fins are clogged or dirty	Clean

Excessive exhaust smoke, white in color	1. Metering oil pump is delivering too much oil 2. Pressure regulator setting too high	Adjust Check adjusting parts and repair or replace them if found defective

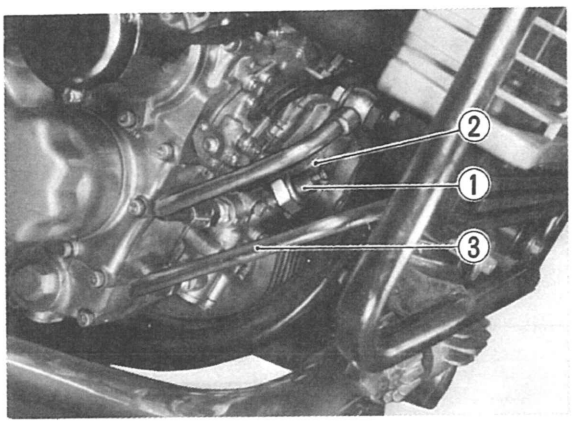

Fig. 5–2 *1. Oil pressure switch*
2. Oil pressure switch lead wire
3. Pressure regulator

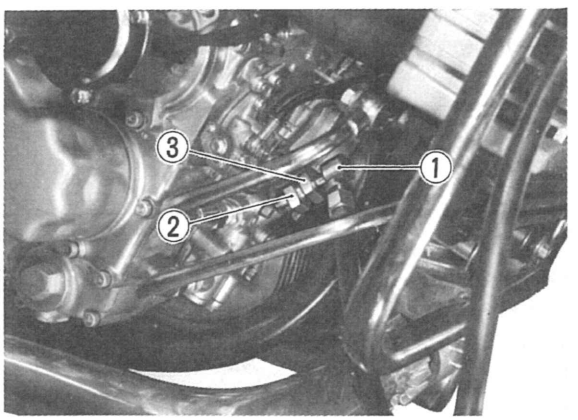

Fig. 5–3 *1. Oil pressure gauge adaptor*
2. No. 1 nut *3. No. 2 nut*

HOW TO CHECK OIL PRESSURE

Use of the **oil pressure gauge (Part No. 09915-73710)** is mandatory in checking the lube oil pressure limited by the pressure regulator. The following procedure is to be followed in the use of this pressure gauge.

1. Disconnect the lead wire from the oil pressure switch. Remove the switch. **(Fig. 5-2)**
2. Install the pressure gauge, securing its adaptor to the tapped hole now vacated by the switch. **Fig. 5-3** explains how to secure the adaptor: tighten No. 1 nut first to **100 kg-cm (7.2 ft-lb)**; and tighten No. 2 nut in such a way that the indicating hand of the gauge will become steady. With the engine running, the indicating hand may oscillate; tightening No. 2 nut increasingly will steady the hand.
3. Bring the engine to a warmed-up condition, with the water temperature gauge coming up to and steadying at 88°C. Adjust No. 2 nut, as necessary, to steady the indicating hand of the pressure gauge.
4. Read the pressure gauge at 1200 engine rpm (idle speed) and at 4000 rpm. The pressure regulator is in satisfactory condition if the first reading is **not** lower than **0.5 kg/cm^2 (7 psi)** and the second reading (at 4000 engine rpm) **not** lower than **5 kg/cm^2 (70 psi).** A lower reading calls for inspection of the oil pump and pressure regulator for possibility of internal oil leakage; the steps to be taken are outlined in **5-3** and **5-4.**

5-2. OIL COOLER AND OIL PIPES

a. Description

The oil cooler is of fin-and-tube type with corrugated fins; its material is essentially an aluminum alloy. It is mounted on the frame, just under the radiator.

b. Removal

1. Remove the oil cooler as outlined in **4-2, page 33.**
2. At the pressure regulator, disconnect the oil pipes by loosening the nuts shown in **Fig. 5-4,** and take out the pipes.

   Caution: When taking out the pipe, be careful not to strain it by forcibly twisting or bending. A strained pipe will give rise to oil leakage.

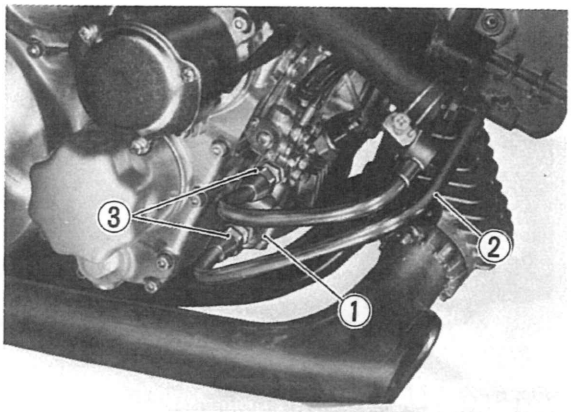

Fig. 5–4 *1. Pressure regulator* *2. Oil pipe* *3. Nut*

c. Inspection

1. Inspect the oil cooler for condition of fins. Bent or flattened fins, if any, must be straightened with a proper hand tool. A plain-tip screwdriver may serve this purpose. **(Fig. 5-5)**
2. If any sign of oil leakage is noted on the oil cooler, particularly in its fin-and-tube part, replace the cooler as a whole.
3. Inspect the oil pipes for cracks. A cracked pipe must be replaced.

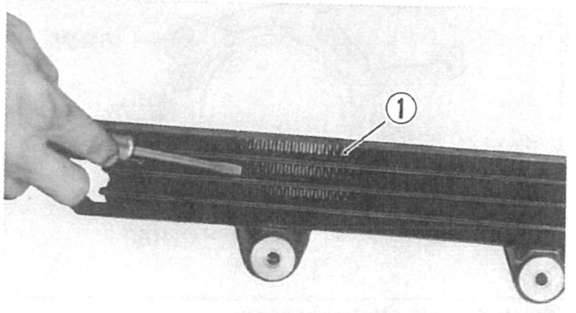

Fig. 5–5 *1. Oil cooler*

d. Installation

Install the oil cooler by reversing the removal procedure. When connecting the oil pressure regulator, be sure to apply **SUZUKI BOND No. 4 (Part No. 99000-31030)** to the thread portion of each nut. The torque specification for these nuts is **400 kg-cm (29 ft-lb).**

5-3. OIL PUMP

a. Description

The oil pump is located inside the contact breaker assembly on the clutch cover. The pump shaft, driven at a speed of half the eccentric shaft speed, doubles as the contact breaker shaft.

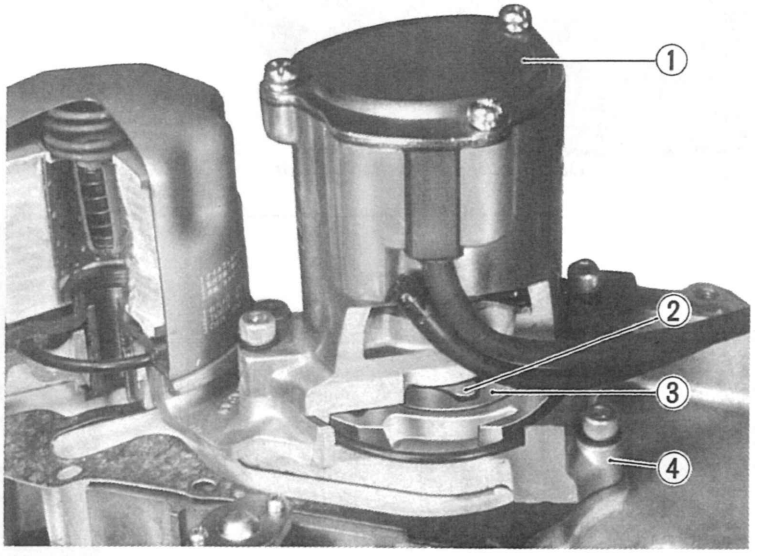

Fig. 5–6 *1. Contact breaker* *2. Inner rotor* *3. Outer rotor* *4. Trochoid pump case*

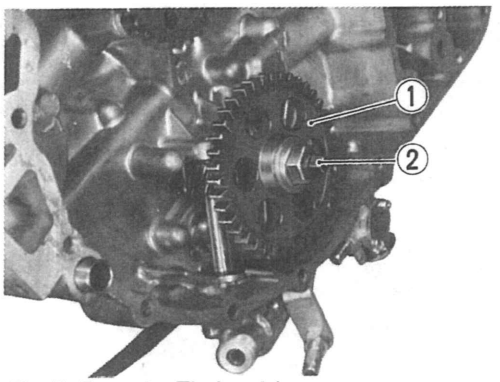

Fig. 5–7 *1. Timing driven gear*
2. Contact breaker shaft

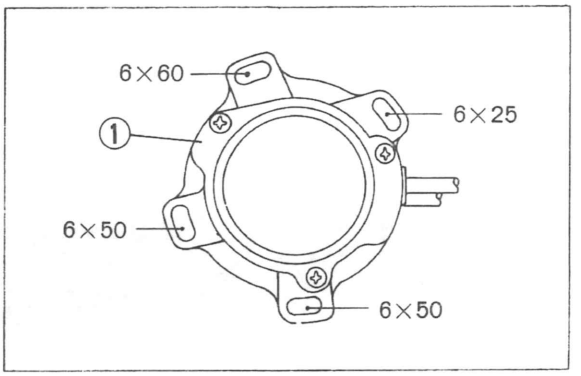

Fig. 5–8 *1. Contact breaker*

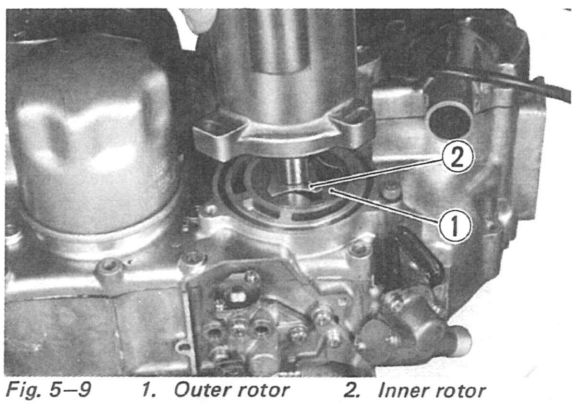

Fig. 5–9 *1. Outer rotor* *2. Inner rotor*

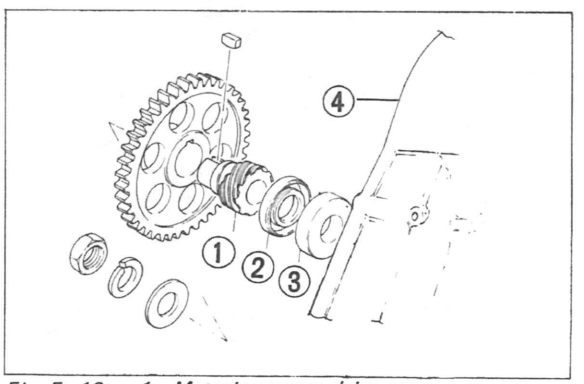

Fig. 5–10 *1. Metering pump drive gear*
2. Oil seal *3. Spacer*
4. Clutch cover

b. Disasembly

1. Remove the clutch cover, as outlined in **2-2, pages 9** to **11** and **13** to **15.**
2. Loosen the nut securing the timing driven gear, and remove the gear. **(Fig. 5-7)**
3. Take out the woodruff key remaining the keyway provided in the contact breaker shaft. It may be necessary to pry the key off the keyway. See **Fig. 5-7.**
4. Loosen the four Allen-head bolts securing the breaker assembly to the clutch colver **(Fig. 5-8).**
5. Remove the contact breaker assembly from the clutch cover by pulling it out.
6. Take out the oil pump inner rotor and outer rotor from the trochoid pump case. **(Fig. 5-9)**
7. Take out the metering oil pump drive gear, oil seal and spacer, in that order. **(Fig. 5-10)**

c. Inspection

1. Inspect the timing driven gear and metering oil pump drive gear for any cracks and wear.
2. Check the outer rotor and inner rotor for wear by measuring the side clearance, tip clearance and outer rotor-to-body clearance. These clearances are identified in **Figs. 5-11A, -11B** and **-11C.** Use a thickness gauge.

   Replace the outer rotor and inner rotor together as a set if the maximum clearance reading at any position exceeds the limit:

   Side clearance limit:
   0.11 mm (0.0043 in.)
   Tip clearance limit:
   0.20 mm (0.0079 in.)
   Outer rotor-to-bore clearance:
   0.15 mm (0.0059 in.)

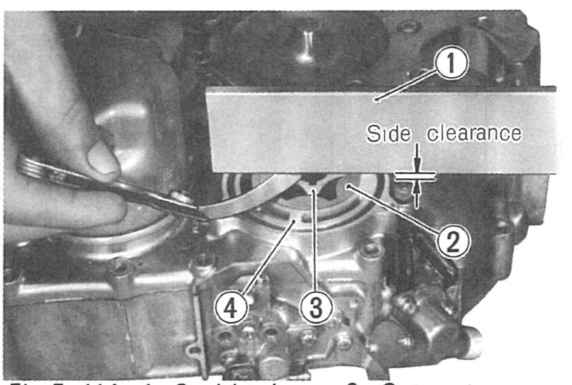

Fig. 5–11A *1. Straightedge* *2. Outer rotor*
3. Inner rotor
4. Trochoid pump case

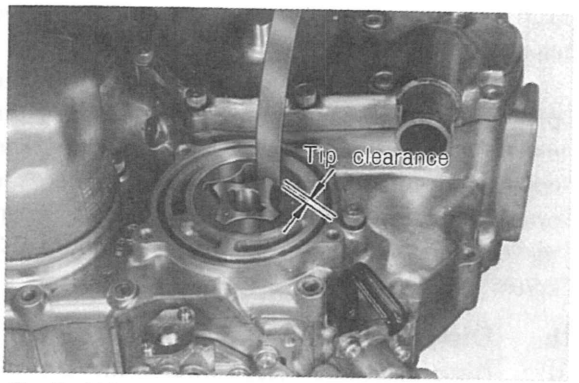

Fig. 5–11B

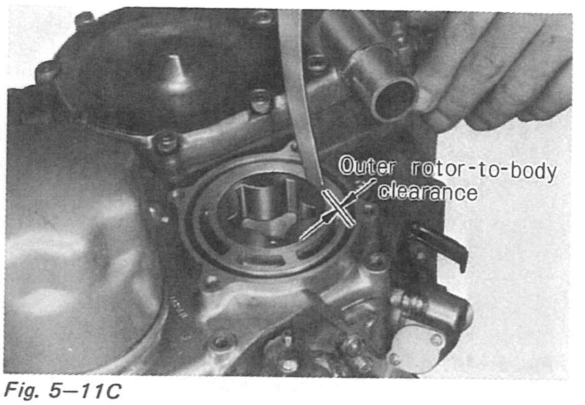

Fig. 5–11C

d. Reassembly

1. Assemble the oil pump component parts sequentially in the order which is reverse of disassemble. Be sure that the inner and outer rotors in place have their punch-marked faces looking outward, as shown in **Fig. 5-12.**
2. Use the **oil seal installer No. 1 (Tool No. 09914-73720)** to fit the contact breaker shaft oil seal by driving into the clutch cover.
3. Position the contact breaker assembly in place and secure it by tightening its four Allen-head bolts to **80** to **90 kg-cm (6.0 ~ 6.6 ft-lb).**

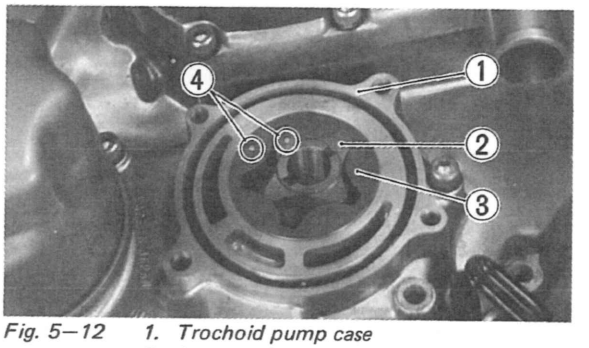

Fig. 5–12 *1. Trochoid pump case 2. Inner rotor 3. Outer rotor 4. Punch mark*

Tighten the timing driven gear nut to a torque anywhere between **300** and **450 kg-cm (22 ~ 33 ft-lb).**

4. Install the clutch cover by reversing its removal procedure.

5-4. OIL PRESSURE REGULATOR AND SWITCH

a. Description

As the engine picks up speed, lube oil pressure rises and, the oil pump being of positive displacement type, the oil pressure could build up to a dangerously high level in the lubrication system unless a means is provided to relieve the excess pressure in such a case.

The pressure regulator serves the purpose of avoiding an abnormal pressure build-up by operating at about 8 kg/cm^2 (113 psi) of rising oil pressure. The regulator is a sort of self-controlling valve; by opening at that pressure level, it bleeds the oil from the oil pump discharge line direct to the oil sump.

The pressure regulator consists of a spring-loaded plunger contained in the regulator body. Oil pressure in the pump discharge line acts on the plunger and, at the predetermined level of rising pressure, the plunger will have moved against the spring force to open the port communicating to the oil sump. When this happens, part of the oil being discharged from the pump is let out of the port in a bleeding manner, thereby limiting the line pressure to that level.

The oil cooler safety valve is built in this pressure regulator. Should the oil side of the cooler become clogged, this safety valve opens to pass the oil direct to the engine. This feature

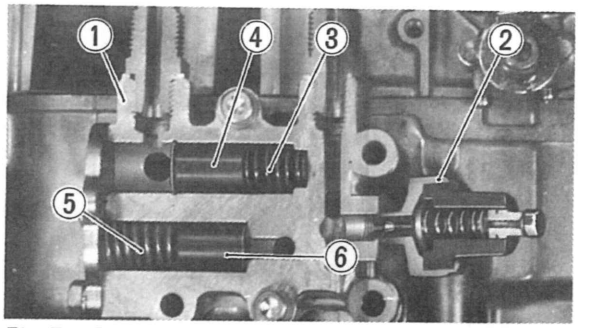

Fig. 5–13 *1. Oil pressure regulator body 2. Oil pressure switch 3. Oil cooler safety valve spring 4. Oil cooler safety valve plunger 5. Pressure regulator spring 6. Pressure regulator plunger*

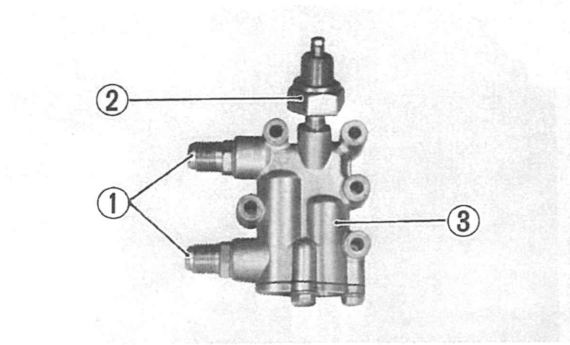

Fig. 5–14 1. *Oil pipe union bolt*
2. *Oil pressure switch*
3. *Oil pressure regulator body*

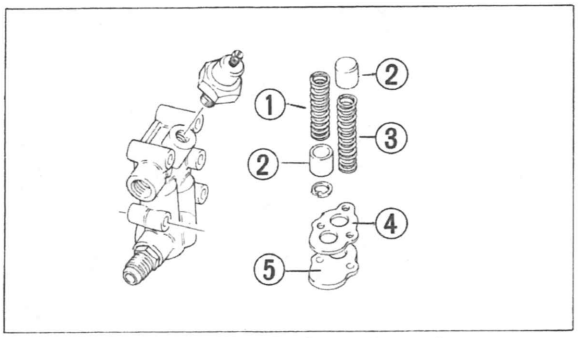

Fig. 5–15 1. *Oil cooler safety valve spring*
2. *Plunger*
3. *Oil pressure regulator spring*
4. *Gasket*
5. *Pressure regulater cap*

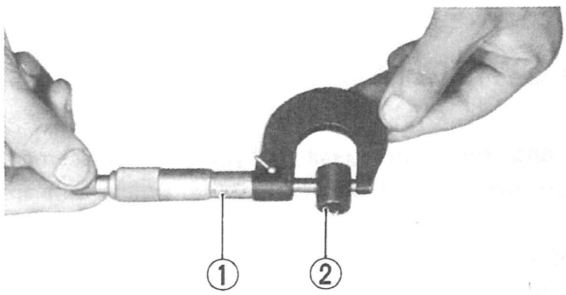

Fig. 5–16 1. *Micrometer* 2. *Plunger*

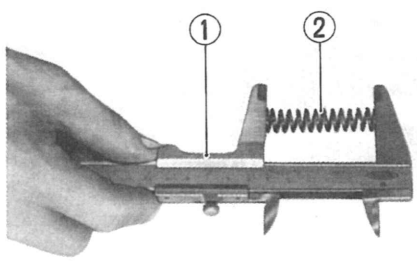

Fig. 5–17 1. *Caliper rule*
2. *Oil pressure regulator spring*

assures the all-time availability of lube oil to the engine.

The pressure switch is installed on the pressure regulator and senses the pressure of the oil that has passed through the oil filter and cooler. It remains in closed position when the pressure is down; its contact point rises to open the circuit when the pressure rises to about 0.3 kg/cm^2 (3.5 psi). **(Fig. 5-13)**

b. Disassembly

1. Disconnect the lead wire from the oil pressure switch.
2. Loosen the five Allen-head bolts securing the pressure regulator to the main case.
3. Disconnect the oil pipes from the pressure regulator by loosening off the nuts and take out the pressure regulator. **(Fig. 5-14)**
4. Disassemble the pressure regulator into parts as shown in **Fig. 5-15.**

c. Inspection

1. Check the plunger for wear by miking its diameter **(Fig. 5-16).** If the mike reading is less than **15.90 mm (0.6279 in.),** replace the regulator as a whole: with the plunger so worn down, the bore should be presumed to have worn down as much.
2. Using a caliper rule, check the regulator spring for stregnth by measuring its free length. Replace the spring if the reading is less than **53.5 mm (2.106 in.).** See **Fig. 5-17.**
3. Similarly check the spring of the oil-cooler safety valve. If the free-length reading is less than **43.0 mm (1.693 in.),** replace the spring.
4. Check the removed oil pressure switch for circuit continuity by hooking the tester as shown in **Fig. 5-18.** If no continuity is noted, it means that the contact point or spring inside is defective to require switch replacement.

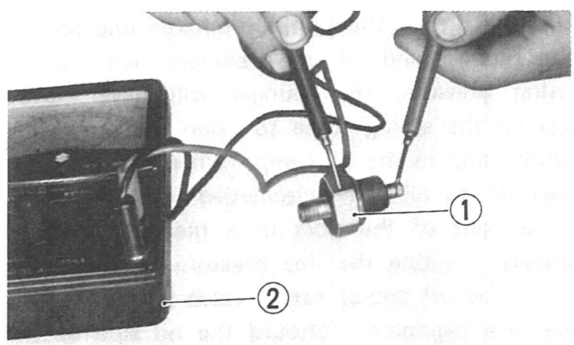

Fig. 5–18 1. *Oil pressure switch*
2. *Circuit tester*

d. Reassembly

Be sure to adhere to the following instructions:

(a) Apply **SUZUKI BOND No. 4 (Part No. 99000-31030)** to the thread portion of the pressure switch just before installing it. Secure the switch by tightening it to **100 kg-cm (7.3 ft-lb).** When assembling the pressure regulator, be sure to apply the R.E. oil to its plunger just before fitting it into the bore. The regulator is to be re-built by reversing the disassembling procedure.

(b) Apply **SUZUKI BOND No. 4** to the screw threads of the oil pipes and nuts when making pipe connections. To secure the pressure regulator in place, tighten the Allen-head bolts to a torque of **80** to **90 kg-cm (6.0 ~ 6.6 ft-lb);** after this tightenening, secure the pipe connections by tightening the nuts to **400 kg-cm (29 ft-lb).**

(c) Be sure to re-connect the lead wire to the oil pressure switch.

5-5. METERING OIL PUMP AND HOSES

a. Description

The metering oil pump is located on the front lower part of the clutch cover, and is driven from the contact breaker shaft through worm and gear. It draws oil from the metering oil tank through a hose line and discharges the oil through two ports, one leading to the carburetor and the other to the final drive chain. The oil going into the carburetor becomes mixed with the fuel, while the other oil drips onto the chain for chain lubrication. These oils are conveyed by two hoses, each containing a check valve to prevent reverse flow of fuel (in the hose connecting to the carburetor) and air (in the hose connecting to the final drive).

b. Removal

1. Remove the cover of the metering oil pump. Removing the two securing screws permits the cover to come off.
2. Disconnect the hose leading from the oil tank. As soon as the hose end comes off, plug it to prevent oil leakage.
3. Loosen the two union bolts on the discharge side of the pump, and disconnect the two hoses.
4. Disconnect the control cable from the oil pump control lever **(Fig. 5-19).**
5. Loosen the two screws securing the oil pump, and take out the pump.
6. Pull out the check valve from the chain oiler hose.
7. Loosen the union bolt on the carburetor fuel inlet. Pull out the check valve from the oiler hose, as shown in **Fig. 5-20.**

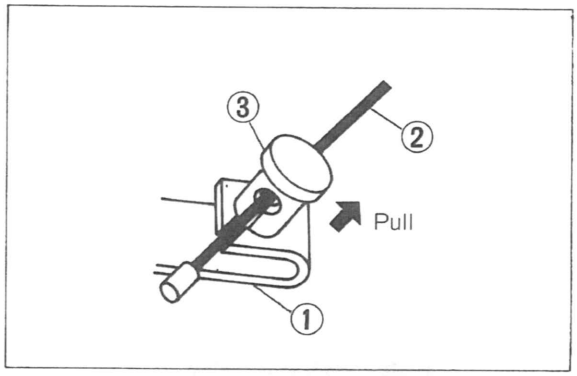

Fig. 5–19 1. Metering oil pump control lever 2. Control cable 3. Cable end piece

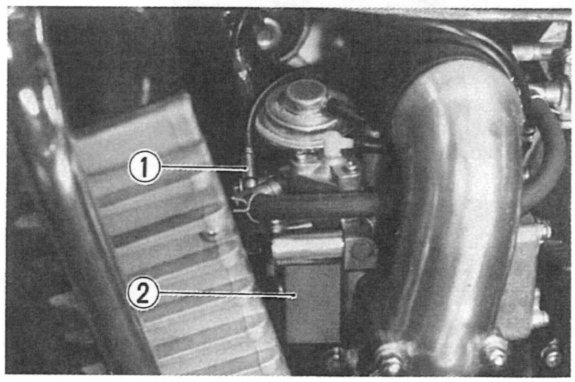

Fig. 5–20 1. Check valve 2. Carburetor

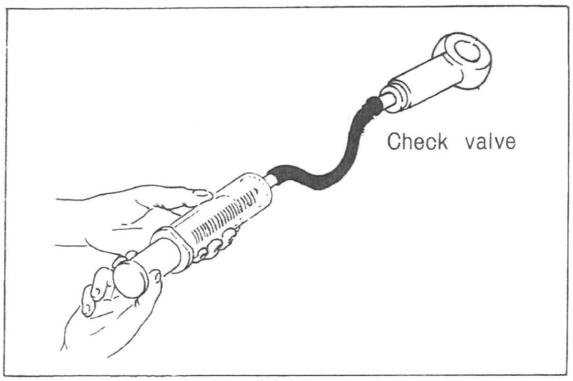

Fig. 5–21 Testing the check valve

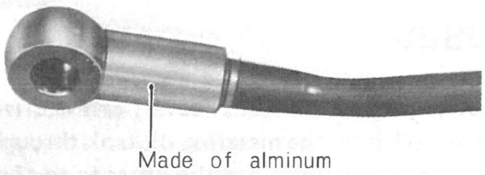

Fig. 5–22 Check valve for carburetor oiler hose

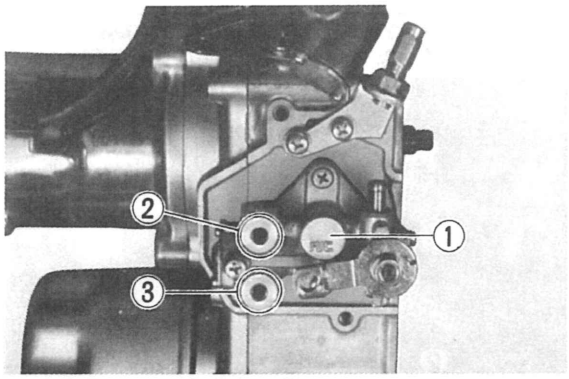

Fig. 5–23
1. *Metering oil pump*
2. *Discharge connection for drive chain oiler hose*
3. *Discharge connection for carburetor oiler hose*

c. Inspection

1. Check the metering oil pump for performance by measuring the rate of oil discharge as outlined in **16-2, page 147**. If the checked rate is short of the specification value, it means that the pump is in deteriorated condition and must be replaced.
2. Check to see if each check valve is capable of proper "checking" by using the injector as shown in **Fig. 5-21.** The one in the chain oiler hose (located in the oil pump side end of the hose) will block the flow of oil when the injector plunger is pushed in, but will present no "drag" at all to the plunger being pulled out if the valve is in sound condition. The other one (located in the carburetor side end of the other hose) will behave conversely if it is not in bad condition. Replace the check valve if found not capable of "checking" action perfectly.

   Note: When replacing the check valves, be sure to discriminate the one for the chain oiler hose from the one for the carburetor oiler hose. They look alike but differ in the direction of "checking." The one for the carburetor is identified by a whitish color body (Fig. 5-22) whereas the other for the chain drive is not marked at all.

d. Installation

Be sure to adhere to the following instruction:

a. When installing the two discharge hoses, make sure that the check valve in the carburetor oiler hose has a whitish color body (made of alminum) and that the check valve in the chain oiler hose does not have such a marking at all. The union bolts for securing these hoses are to be tightened to a torque of **20** to **30 kg-cm. (1.4 ~ 2.2 ft-lb).**

b. Of the two discharge connections on the metering oil pump, be sure to tell the one for chain drive lubrication from the other and to tie in the two hoses accordingly. Double-check the hose connections after tightening the union bolts. Wrong hose connection is sure to result in an engine seizure because the carburetor then will receive too little an amount of metered oil. **(Fig. 5-23)**

5-6. METERING OIL TANK AND OIL LEVEL GAUGE

a. Description

The oil tank, from which the metering oil pump draws oil, is mounted on the left-hand side of the chassis. It has a built-in oil level unit for controlling the oil level indicator lamp. This lamp is located on the face of the speedometer/tachometer; it is a warning lamp and, as such, comes on when the level becomes dangerously low. The level unit is actually a switch actuated by a magnetic float. **(Fig. 5-24)**

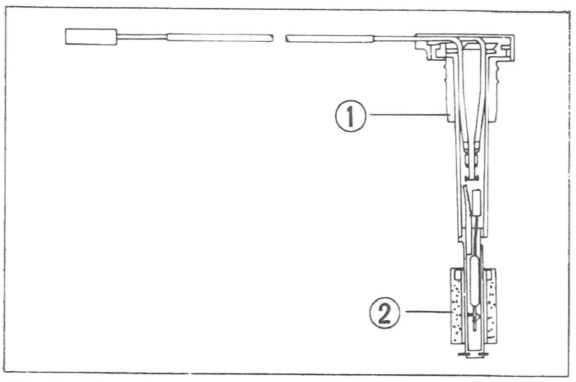

Fig. 5–24 1. Metering oil level gauge 2. Magnetic float

b. Inspection

Test the oil level gauge system in the following manner:

1. Hold the motorcycle standing erect by its center stand, and remove the left-side frame cover.
2. Connect the tester to the level unit, as shown in **Fig. 5-25;** lower the oil level gradually, and see if the tester indication changes from **infinity** to several ohms when the level falls to a depth anywhere between **85** and **95 mm (3.35 ~ 3.75 in.)** as measured from the tank ceiling; if not, replace the oil level unit. What is important is not the ohmic value but the change of tester indication from "open" to "close" in the depth range stated above.

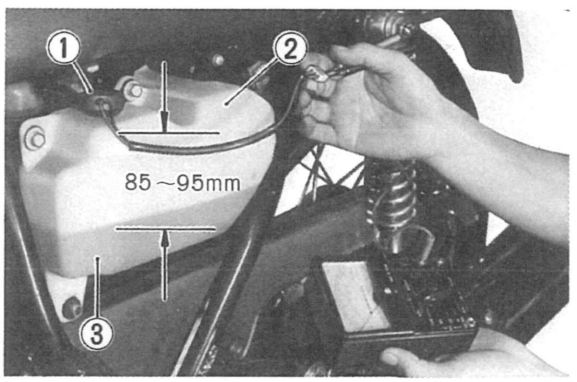

Fig. 5–25 1. Metering oil level gauge
2. Metering oil tank
3. Engine oil

FUEL SYSTEM

GROUP 6

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6-1. GENERAL DESCRIPTION

DESCRIPTION

The total capacity of the fuel tank is 17 litres (4.5/3.7 US/Imp. gal.). The fuel outlet with its fuel cock is so constructed that the fuel contained is available to the carburetor in three selective ways, the selection being made by means of the fuel cock, located below the left-hand bottom part of the fuel tank. The lever of this cock has three positions, "ON," "RES (for "reserve")," and "PRI (for "priming")."

The carburetor is mounted to the left of the engine. It is a two-barrel two-stage carburetor designed specially for the rotary engine of the RE5 motorcycle.

SPECIFICATIONS

Fuel tank total capacity	17.0 litres (4.5/3.7 US/Imp. gal.)
Carburetor	Model 18-32 HHD MIKUNI two-barrel two-stage carburetor

Carburetor setting table

Venturi diameter (mm)	Primary Secondary	15.0 27.0 x 8.0 (large x small)
Throttle valve bore dia. (mm)	Primary Secondary	18.0 32.0
Main jet	Primary Secondary	#87.5 #180
Main air bleed jet	Primary Secondary	#80-A #80-A

Pilot jet	Primary Secondary	#45 #70
Pilot air jet	Primary Secondary	#145 #140
Throttle valve tilt angle	Primary Secondary	#80 (8°) #120 (12°)
Port valve tile angle		#150 (15°)
Bypass diameter (mm)	Primary Secondary	No. 1, 0.8 ; No. 2, 0.6 1.0
Main nozzle diameter (mm)	Primary Secondary	1.8 3.5
Pilot outlet diameter (mm)		1.8
Valve seat diameter (mm)		3.0
Accelerating pump nozzle diameter (mm)		0.4
Accelerating pump capacity (cc/stroke)		0.5 ~ 1.0
Accelerating pump start-of-action angle		35 ± 5°
Fast idle opening angle		25.5 ± 0.75°
Port valve lever touch angle		36 ± 1°
Choke unloader opening angle		37.5 ± 0.75°
Float level (mm)		43.3

TROUBLE-SHOOTING

Symtom	Probable cause	Remedy
Engine will not start up	1. Choke valve open too wide	Close
	2. No fuel in the tank	Fill
	3. Primary pilot jet or primary pilot air jet is clogged	Clean
	4. Pilot screw out of adjustment	Adjust
	5. Clogged fuel cock or pipe	Clean
	6. Clogged air vent hole in the fuel-tank filler cap	Clean
	7. Fuel cock diaphragm ruptured	Replace
Engine idles unsteadily	1. Primary pilot jet or primary air jet is clogged	Clean
	2. Pilot screw out of adjustment	Adjust
	3. Fuel level too high or too low in float chamber	Adjust
	4. Air leakage	Retighten all air passage connections
	5. Unloader diaphragm ruptured	Replace This rupture could occur when choke lever is misoperated
	6. Clogged fuel strainer	Clean
	7. Leaky or ruptured diaphragm in the fuel cock	Retighten the diaphragm or replace the fuel cock

Engine runs erratically in medium	1. Loose or clogged primary main jet 2. Loose or clogged primary air bleed jet 3. Fuel level too high or too low in float chamber 4. Clogged fuel strainer 5. Air leakage	Retighten or clean Retighten or clean Adjust Clean. Retighten all air passage connections
Engine runs erratically in high speed range	1. Loose or clogged main jets 2. Reputured secondary diaphragm 3. Starting angle for port valve is out of adjustment 4. Enrichment diaphragm ruptured 5. Loose or clogged secondary pilot jet or secondary pilot air jet 6. Clogged fuel strainer 7. Accelerating pump diaphragm ruptured 8. Float is not maintaining fuel level properly 9. Air leakage	Retighten or clean Replace Adjust Replace the diaphragm Retighten or clean Clean Replace the diaphragm Adjust Retighten all air passage connections

6-2. CARBURETOR

a. Description

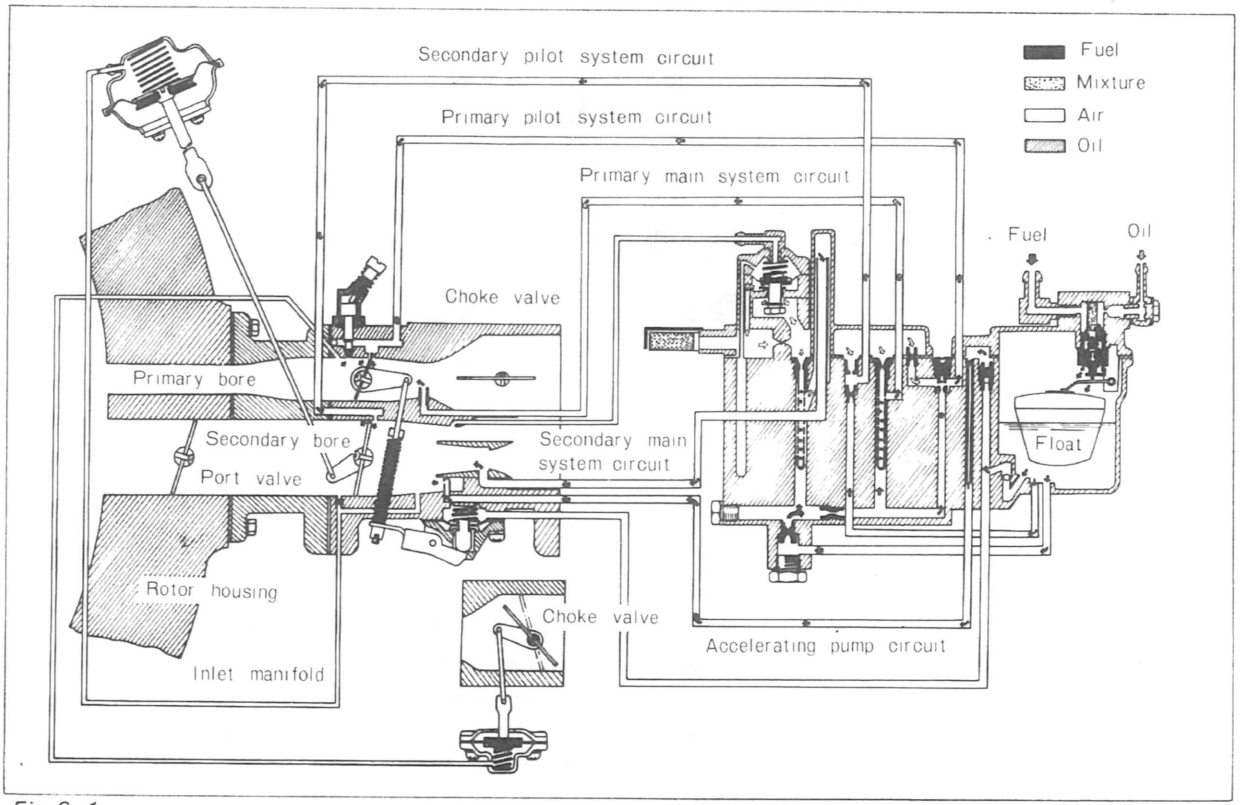

Fig. 6–1

Fuel-air mixture is supplied from the primary and secondary bores of the carburetor through the intake manifold to the two independent inlets provided in the rotor housing. The mixture supply is controlled from the throttle grip by means of primary throttle valve in the primary bore and also of port valve in the secondary intake port. Another means of control is the secondary throttle valve in the secondary bore, which is actuated by the vacuum present in this bore.

A throttle cable connects primary throttle valve to the grip in such a way that there is a proportionality between grip position and valve position. In fully closed position, this valve is off the vertical, the angle of tilt being 8 degrees.

Another cable connects the port valve to the throttle grip. This cable linkage is such that the port valve begins to open only when the grip has moved the primary throttle valve to the 36° open position. From this point onward, the two valves open together and reach their full-open positions at the same time as the grip is twisted further toward the end of its stroke.

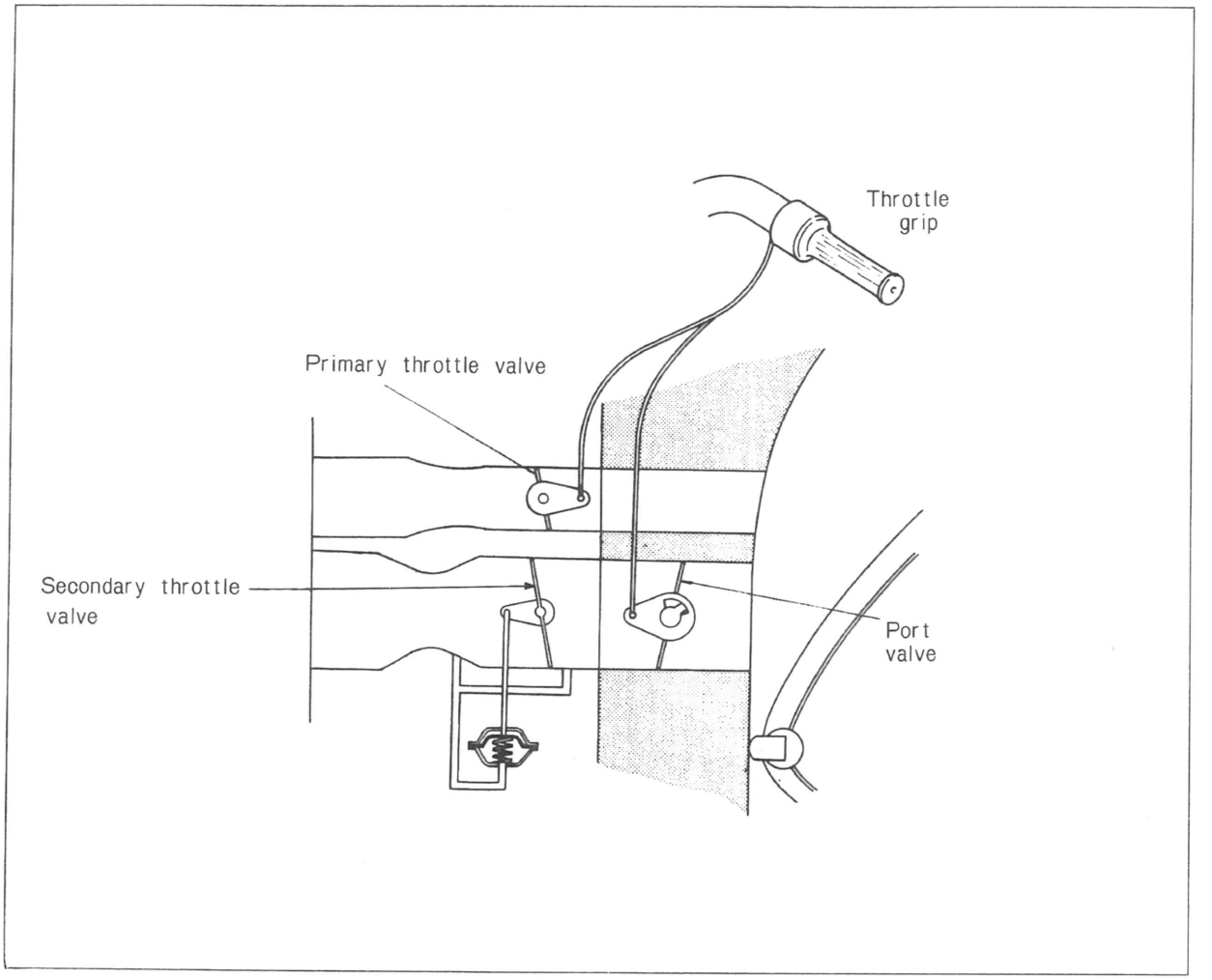

Fig. 6–2

The function of the port valve is to minimize the volume of the space communicating to the active space formed between rotor and housings within the engine when the primary throttle valve is only partially, but not quite even half, open. This arrangement is necessary because, as in all engines of peripheral port suction type of which the rotary engine is one, some of exhaust gas tends to flow back into the suction side when a timing overlap of intake port and exhaust port occurs. The amount of this back-flow (which could thin the fuel-air mixture) is minimized by keeping the port valve closed in order to assure stable fuel combustion in the low- or partial-load condition of the engine. **(Fig. 6-2)**

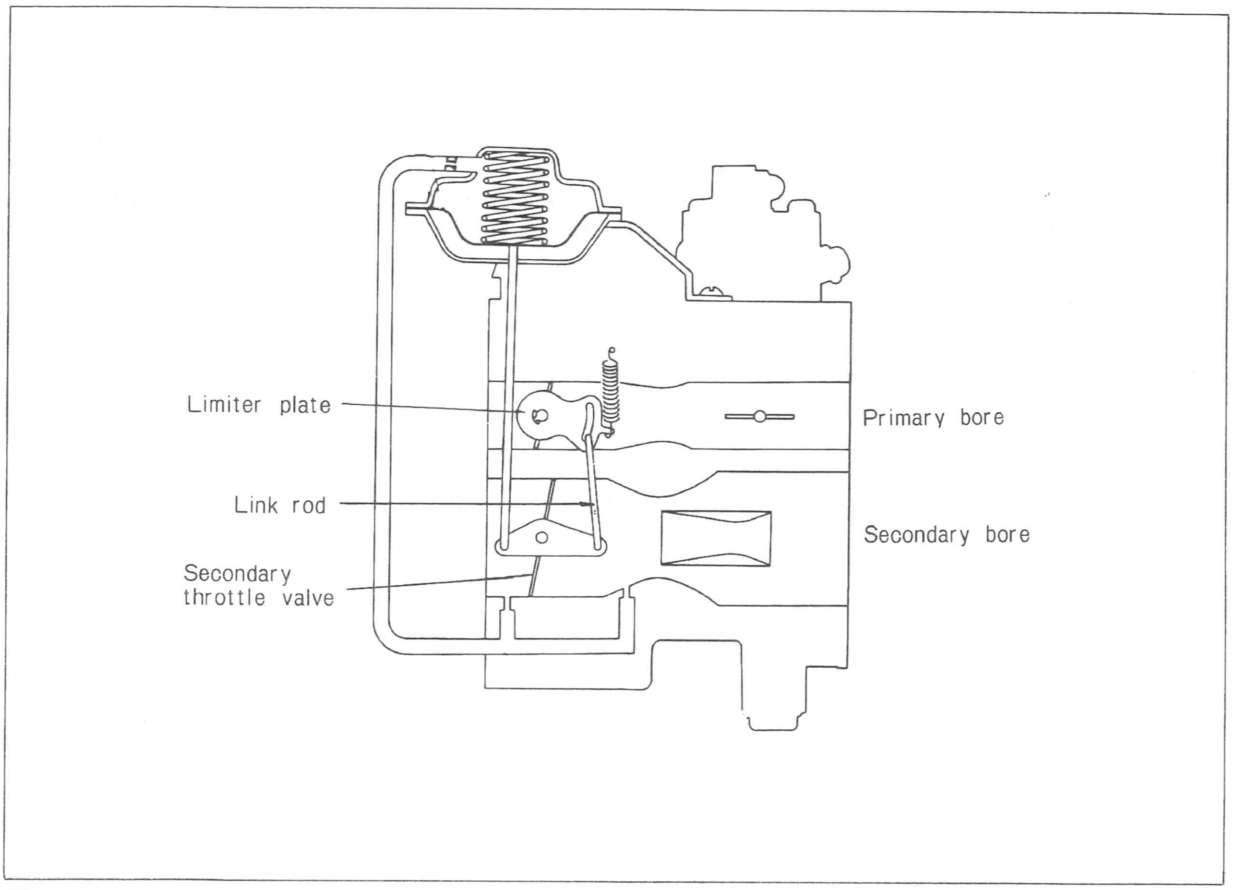

Fig. 6–3

The vacuum-actuated secondary throttle valve is prevented from opening by the linkage between this valve and the primary throttle valve until the latter valve opens and comes to the half-open (41°) position. As the latter valve opens further, the former valve may open as far as is permitted by the latter or may lag behind the latter, depending on the vacuum condition in the secondary bore.

Actually, the restraint on the secondary throttle valve by the primary one begins to lessen when the primary valve opens to the 41° position – the position at which the limiter plate, shown in **Fig. 6-3,** starts moving with the primary valve.

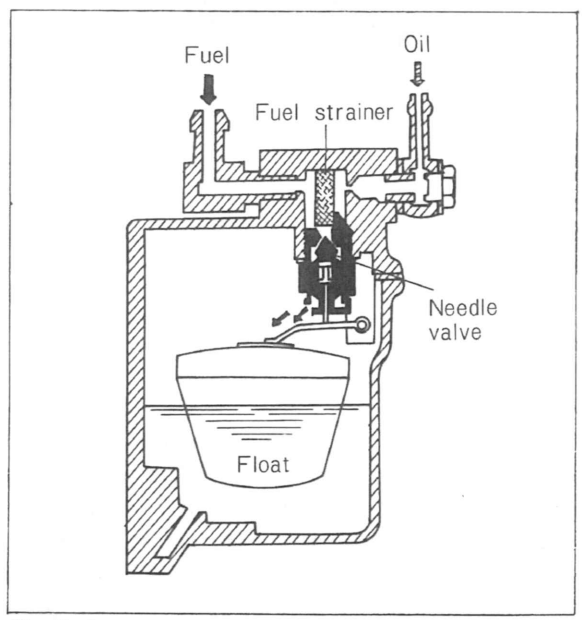

Fig. 6–4

Referring to **Fig. 6-4,** fuel is supplied by gravity from the fuel tank. Upon arriving at the carburetor, the fuel flows through the strainer, then mixes with the oil fed in by the metering oil pump, and enters the float chamber through the needle valve actuated by the float. The needle valve and float cooperate to maintain the fuel up to a certain constant level.

The fuel level in the float chamber is part of the carburetor setting, and is specified on the basis of the metering jets used in the carburetor. Too high or too low a fuel level shows up quickly as a poor carburetor performance.

The float is made of a gasoline proof foam plastic. An air vent is provided in the float chamber so that the atmospheric pressure acts on the surface of fuel.

Carburetor operation will be described under five headings: SLOW SYSTEM, PRIMARY MAIN SYSTEM, SECONDARY MAIN SYSTEM, ACCELERATING PUMP and STARTING SYSTEM:

SLOW SYSTEM

The slow system meets the fuel-air mixture requirements of the engine running with primary throttle valve not much open, that is, when the engine is idling, carrying light load or running in low-speed range.

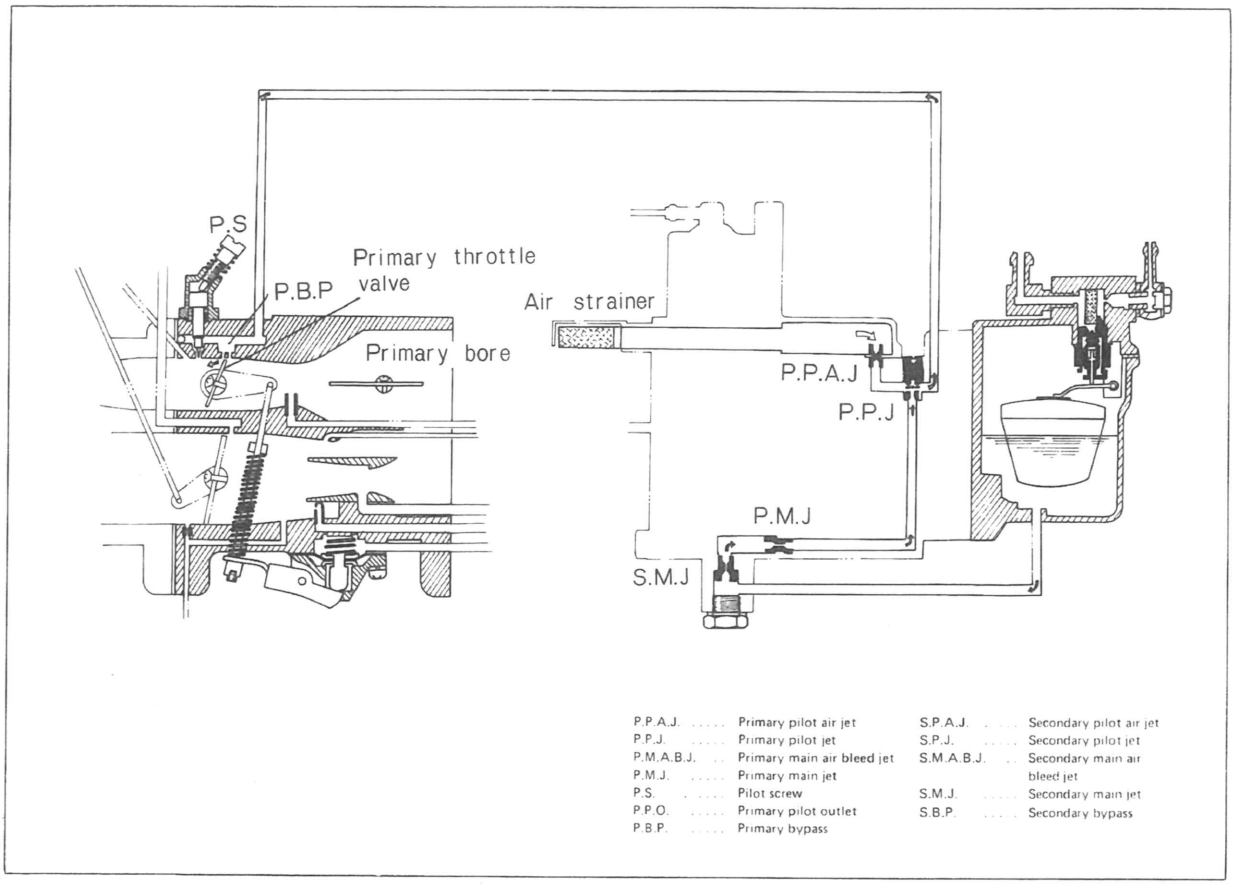

Fig. 6–5 Slow system

Fuel flows from float chamber through three jets – secondary main jet, primary main jet and primary pilot jet, in that order. The pilot jet meters this fuel. The metered fuel spurts out of the small orifices provided in the middle part of the pilot jet and immediately mixes with the filtered air that has been metered by primary pilot air jet. The mixture is foamy at this stage, containing tiny air bubbles.

This mixture is sprayed into the primary bore through two openings. One is the bypass orifice, opening out into the bore in the vicinity of primary throttle valve, to which part of the mixture reaches. The other is the pilot outlet, to which the remainder of the mixture reaches after getting metered by the pilot screw.

The rich mixture sprayed out of the pilot outlet and bypass orifice is then carried away by the air flowing in past the periphery of primary throttle valve. Complete fuel vaporization or carburetion takes place before the fuel-laden air gets sucked into the engine. **(Fig. 6-5)**

PRIMARY MAIN SYSTEM

This system supplies fuel at a rate necessary for sustaining the cruising condition of the motorcycle in the normal speed range, and does its job in the most efficient manner to score the highest possible fuel economy. The overall fuel economy inherent in the motorcycle is keyed to this system.

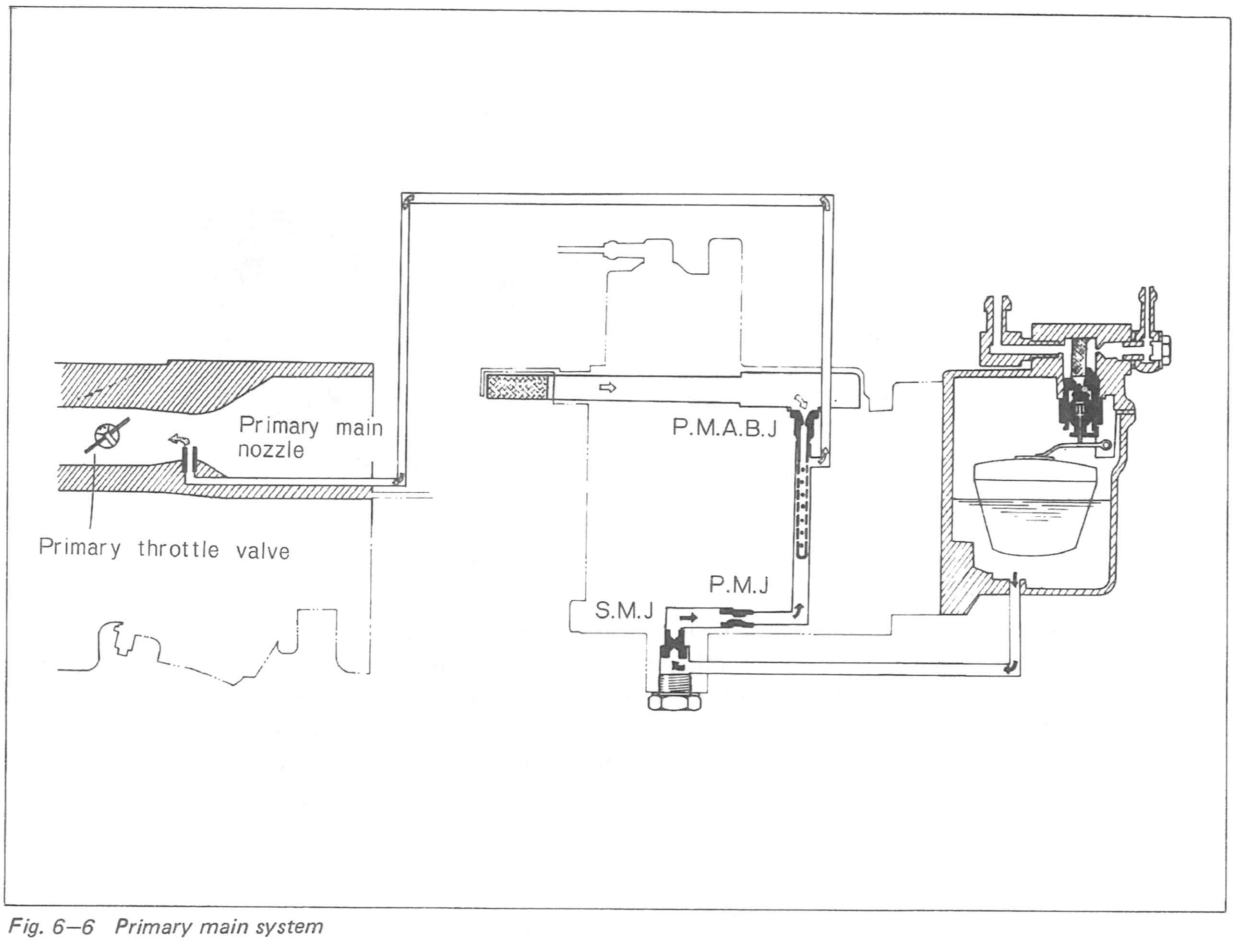

Fig. 6–6 Primary main system

When primary throttle valve moves to the 18-deg. position or thereabout, main nozzle in the venturi begins to spray out fuel. Under this condition, the fuel passes secondary main jet first, then gets metered out by primary main jet and reaches primary main air bleed jet. At this air bleed jet, it mixes with the filtered air that has been metered by this bleed jet and is now coming out of tiny orifices provided in the jet. Thus, the fuel reaching the main nozzle is in a foamy condition – the condition calculated to facilitate carburetion in the primary bore.

SECONDARY MAIN SYSTEM

As one reaches the start of an uphill road, one would twist the grip toward "full throttle" position. This is to make the engine carry heavier load than before, and primary throttle valve will open wider. As the valve takes the 41-deg. position or a position beyond this, secondary throttle valve gains some freedom of movement in the opening direction. This is the point at which the secondary main system comes into action.

How secondary throttle valve opens has already been explained. With this valve slightly open, the vacuum at secondary main nozzle in the secondary bore is not great enough to make this nozzle spray out fuel and, unless a provision is made to offset the inaction of the nozzle, the fuel-air mixture being drawn into the engine would become leaner. That provision is a compensating circuit, similar in function

to the primary slow system, which terminates in a port (secondary bypass) opening into the secondary as shown in **Fig. 6-7.**

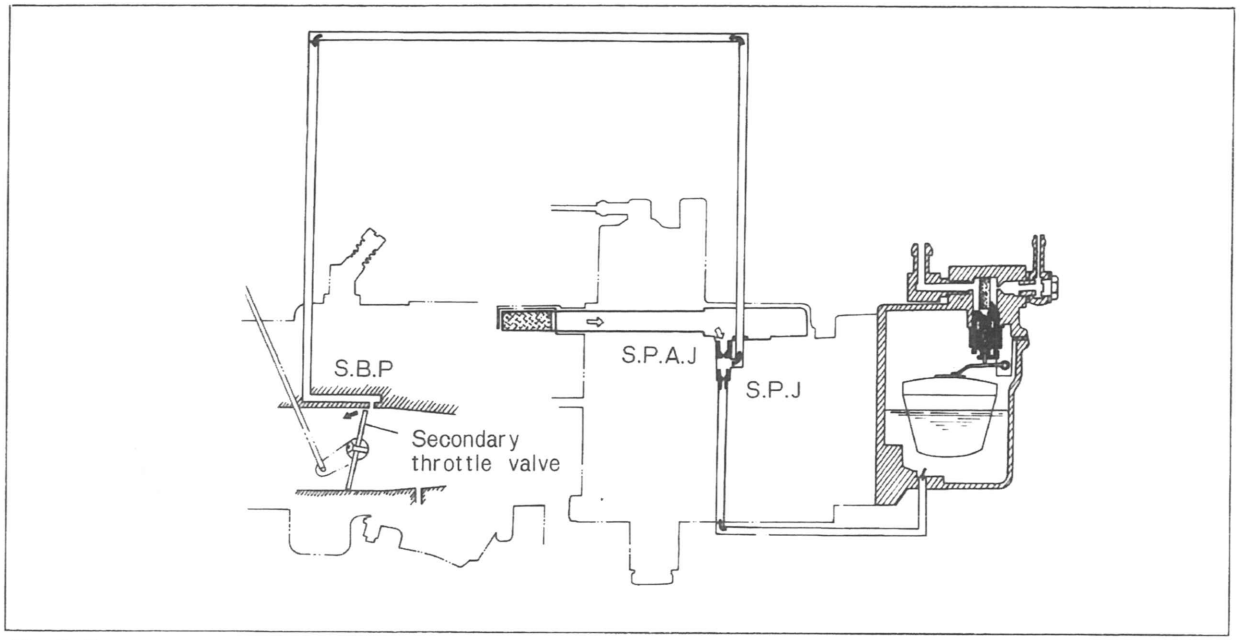

Fig. 6–7

The compensating port comes into a vacuum region when secondary throttle valve opens but slightly, so that augmenting fuel is drawn out of this port. This fuel comes through secondary pilot jet, after which it mixes with the air admitted through air strainer and secondary pilot air jet and then flows into the passage leading to the port mentioned above. Metering actions on this supply are accomplished by the pilot jet (for fuel) and the pilot air jet (for air), both secondary. The port is situated right above the throttle valve, and sprays out the compensating fuel already mixed with air bubbles.

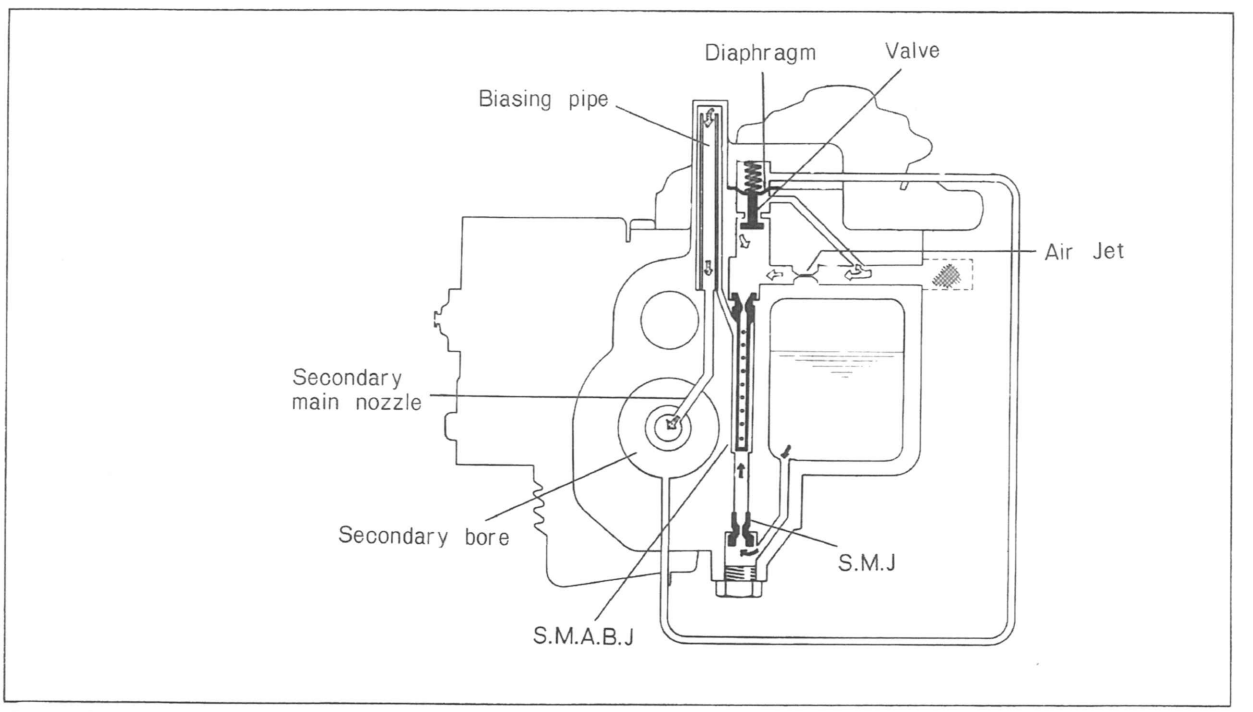

Fig. 6–8A Secondary main system

Assume that secondary throttle valve opens wider, beyond its 15-deg. position. Under this condition, fuel coming out of the float chamber is metered by secondary main jet and then reaches secondary main air bleed jet, as shown in **Fig. 6-8A.**

The filtered air reaches the main air bleed jet through two paths: one is through air jet and the other is through the diaphragm-actuated valve. A relatively large amount of air comes to the air bleed jet, wherein it mixes with the fuel (metered by secondary main jet). The resultant foamy fuel is then drawn up through the biasing pipe before reaching secondary main nozzle. This nozzle is located inside the inner ventury in the venturi section of secondary bore. It should be noted here that the air is metered by the main air bleed jet at this time, and that the other jet—air jet—does not take part in the metering action though this jet too is a metering jet.

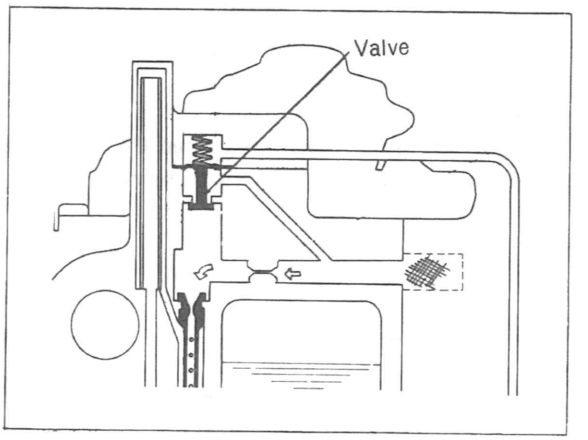

Fig. 6–8 B Secondary main system

Suppose the engine picks up speed in the foregoing condition in which secondary main nozzle is injecting fuel into the secondary bore. The engine needs an increasingly rich fuel-air mixture to rise further in running speed. In this case, the vacuum in the secondary bore becomes greater and, when secondary throttle valve moves past its 45-deg. position, the diaphragm on the air valve **(Fig. 6-8A)** deflects upward to seat the valve. Refer to Fig. **6-8B.** When this stage is reached, the air coming into secondary main air bleed jet is that which is metered by the air jet and which is less than when the air valve was open, so that the fuel being sprayed out into the secondary bore carries a lesser amount of air to enrich the fuel-air mixture flowing into the engine. The diaphragm-actuated air valve and air jet constitute an enrichment device.

ACCELERATING PUMP

To pick up speed quickly during cruising, the rider twists the throttle grip snappily, causing the throttle valves to open wider promptly, and this will instantly increase the amount of incoming air. The

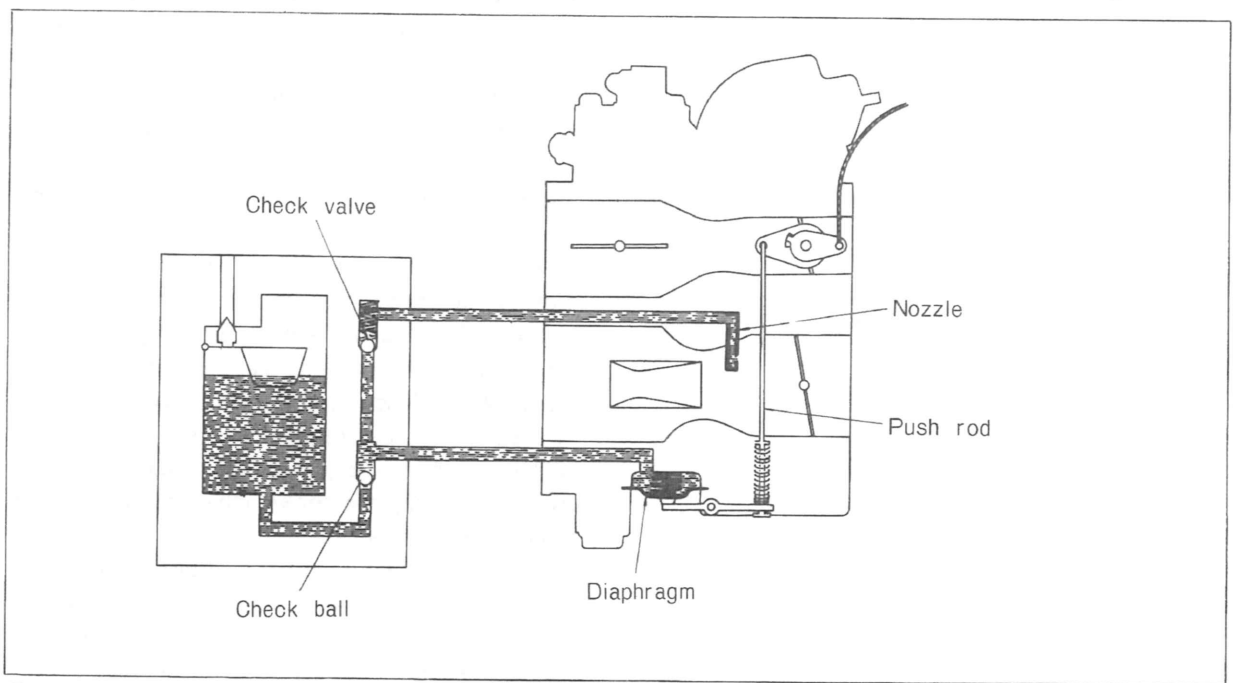

Fig. 6–9 Accelerating pump

fuel is heavier than air and, because of its inertia, cannot respond so quickly as the air. The result would be a temporarily thinned fuel-air mixture, were it not for the accelerating pump.

How the accelerating pump prevents this temporary thinning of the mixture is shown in **Fig. 6-9.** As the grip is twisted sharply, the push rod moves down and, through its spring and the pump lever, pushes up the pump diaphragm to force out the fuel in the pump chamber. One shot of fuel is thus injected into the secondary bore. The spring-loaded outlet check valve in the passage of this fuel unseats itself to allow the fuel to reach the accelerating pump nozzle protruding into the bore.

As the throttle grip is turned back, the pump diaphragm deflects back under the force of its spring to draw in fuel from the float chamber through the inlet check valve.

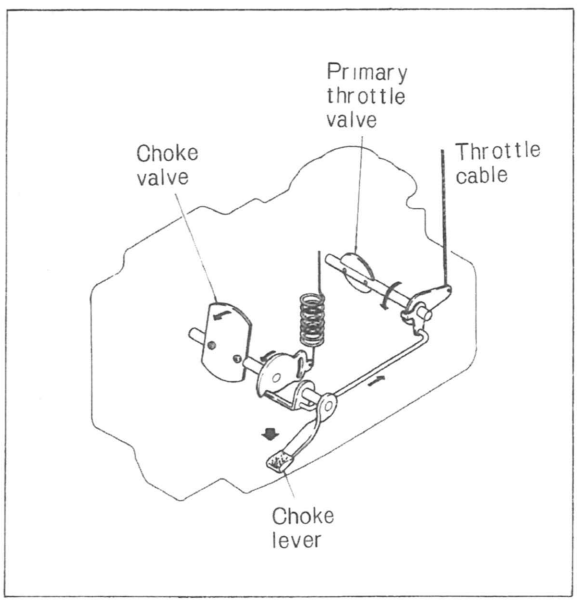

Fig. 6–10 Fast idle mechanism

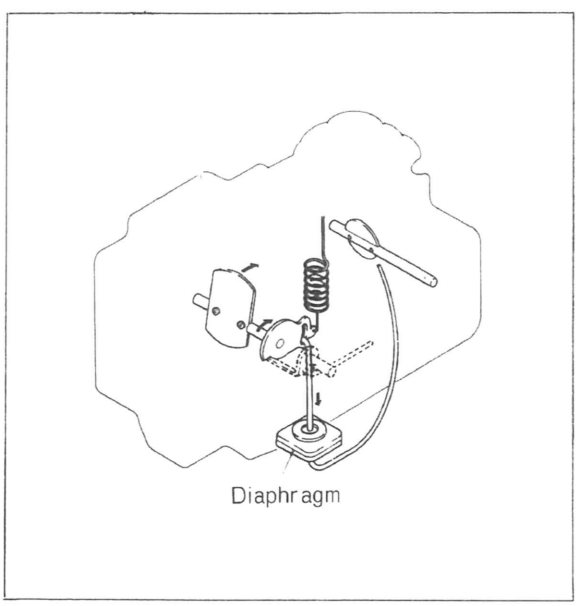

Fig. 6–11 Choke unloader mechanism

STARTING SYSTEM

This system is for providing a particularly rich fuel-air mixture needed by a cold engine to fire up without requiring a prolonged cranking operation. Its main active part is the choke valve mounted in the primary bore.

Pushing down the choke lever turns the choke valve into closed position to block the primary bore completely. At the same time, the push rod linked to the choke lever actuates primary throttle valve into a partially open position, which is slightly beyond its idle position.

With the throttle valve in that open position, fuel spray from primary main nozzle is facilitated (when the engine is being cranked for starting up) and, moreover, the engine is assisted to sustain its idling condition after firing—a feature desirable for a cold engine. This mechanical arrangement for keeping the throttle valve partially open is referred to as the fast idle device. **(Fig. 6-10)**

After the engine fires up under the foregoing condition, the highly rich mixture must be made less rich so that the engine will shift into stable idling state. This need is met by forcing the choke valve to open just a little. The mechanism for moving the choke valve in this manner is shown in **Fig. 6-11**; it consists of a diaphragm, linkage, spring, lever and cam—collectively referred to as the choke unloader mechanism. As the engine fires up and starts running by itself, the vacuum in primary bore rises; this high vacuum is made use of in forcing the choke valve to a crack-open position mentioned above.

Another feature on the choke valve is that its shaft divides the valve into two unequal halves. When this valve opens, its larger half tilts toward the engine side. Thus, when the engine fires and picks up speed in "choked" condition, the

increasingly large differential force acting on the valve causes it to open, so that the fuel-air mixture is prevented from getting too rich or is rendered less rich. The faster the engine is running after firing up, the greater the effect of the differential force for avoiding over-enrichment of the mixture. **Fig. 6-12** illustrates this point.

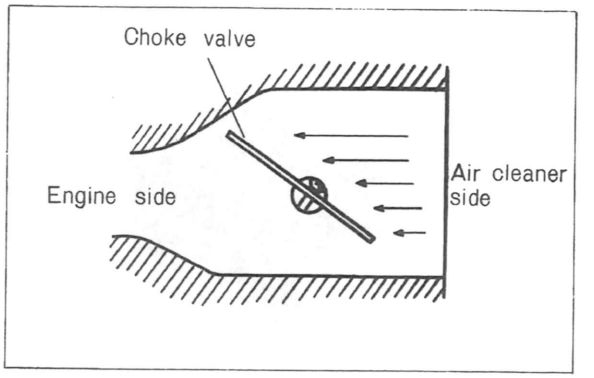

Fig. 6–12

b. Disassembly

1. Take down the carburetor as outlined in **GROUP 2-2, pages 9** and **10.**
2. Disconnect the two hoses from the secondary diaphragm assembly and enrichment diaphragm assembly by pulling each hose off. Loosen the two mounting screws securing the secondary diaphragm assembly, and remove the assembly. Pull out the rod, shown in **Fig. 6-13.**
3. Remove the four screws fastening down the float chamber top, and take off the top. **(Fig. 6-13)**

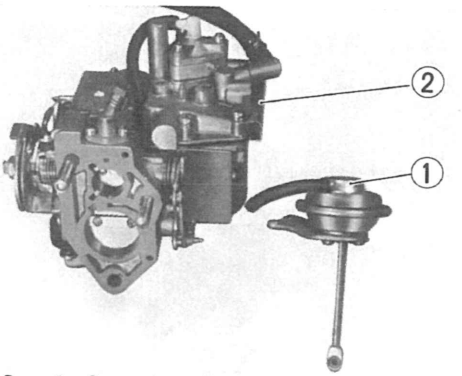

Fig. 6–13 *1. Secondary diaphragm*
2. Float chamber top

4. Remove P.P.A.J.; S.P.A.J.; P.P.J.; P.M.A.B.J.; accelerating-pump check valve; accelerating-pump needle; and S.M.A.B.J.—all from the carburetor body. See **Fig. 6-14.**

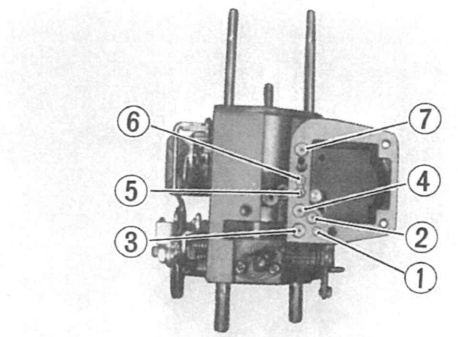

Fig. 6–14 *1. P.P.A.J.* *2. S.P.A.J.*
3. P.P.J. *4. P.M.A.B.J.*
5. Acceleration pump check valve
6. Acceleration pump needle
7. S.M.A.B.J.

5. Loosen the plugs and take out the P.M.J. and S.M.J. **(Fig. 6-15).**

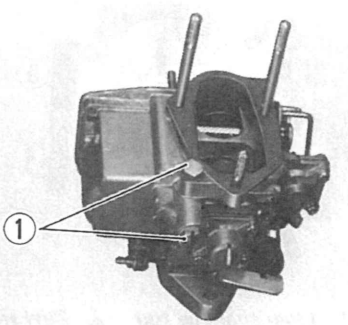

Fig. 6–15 *1. Plug*

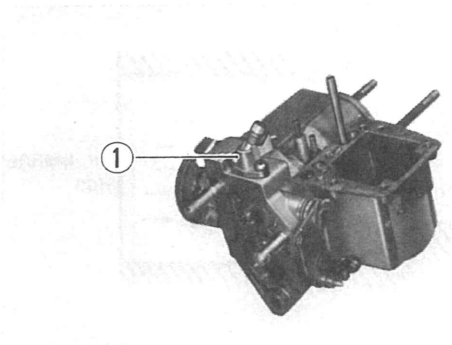

Fig. 6–16 1. Pilot screw assembly

6. Remove the two screws securing the pilot screw assembly to the carburetor body, and take off the screw assembly. **(Fig. 6-16)**

Note: Do not disturb the pilot screw when removing the screw assembly. This screw is factory-set for proper idling on the basis of flow measurements taken on each individual carburetor unit. Restoring a disturbed pilot screw to the original set position is a lengthy, complicated procedure.

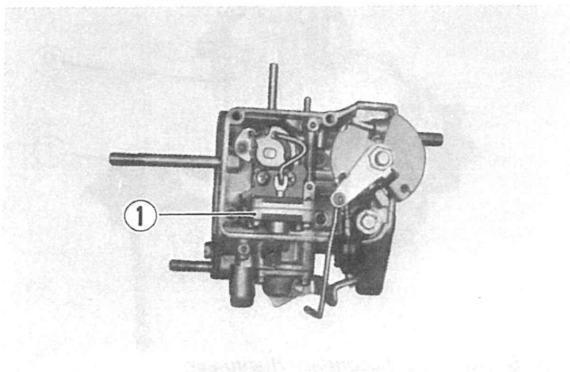

Fig. 6–17 1. Unloader diaphragm assembly

7. Remove the unloader diaphragm assembly by loosening two screws. An "O" ring comes off from the vacuum inlet. Be sure to recover this ring. **(Fig. 6-17)**

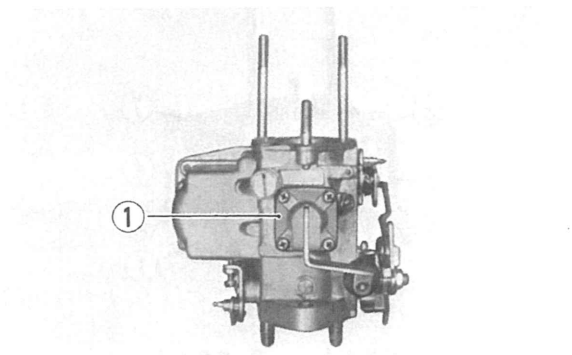

Fig. 6–18 1. Accelerating pump diaphragm assembly

8. Remove the accelerating pump cover. This cover comes off when the cotter pin (in the end of the pump rod) and four securing screws have been removed. **(Fig. 6-18)**

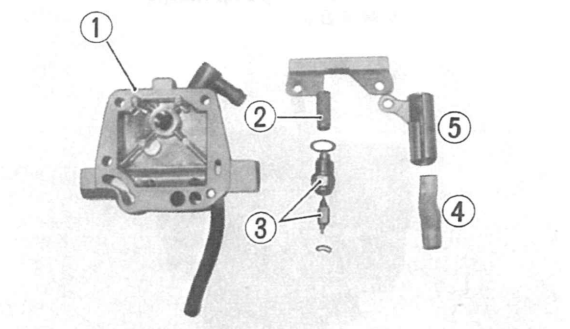

Fig. 6–19 1. Float chamber top 2. Fuel strainer 3. Float needle valve 4. Air strainer 5. Air strainer cover

9. Take out the float needle valve assembly, and pull out the fuel strainer from the float chamber top. Remove the air strainer cover. **(Fig. 6-19)**

10. Place all the parts (removed from the carburetor) in a pan filled with clean gasoline, with the exception of diaphragms, which are to be kept in a dry clean pan. Make proper provisions so that each removed part can be identified.

c. Inspection

1. Float level check

This check is for making sure that the float and needle valve will maintain the fuel up at the specification level. The procedure is as follows: Set the float as shown in **Fig. 6-20** so that the float arm just barely touches the float valve; in this position, measure the height from the float chamber surface (less gasket) to the float bottom, using a caliper rule.

The standard height is **43.3 mm (1.705 in.)**. If the measurement taken is off the standard value, adjust it by bending the float arm carefully.

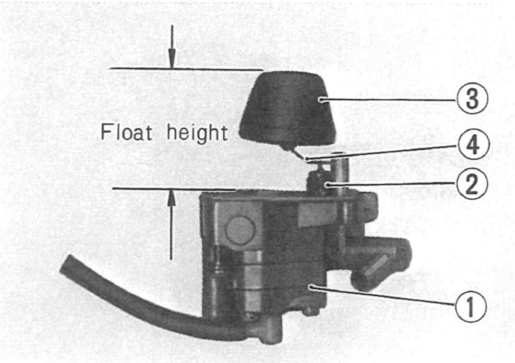

Fig. 6–20 *1. Float chamber top 2. Float needle valve 3. Float 4. Float arm*

2. Accelerating pump check

This check is for verifying the pumping action, and is to be carried out as follows: Keep secondary throttle valve in "full open" position and peep into the secondary bore from the throttle valve side; actuate the lever by hand; and see if the accelerating pump nozzle shoots out fuel **(Fig. 6-21)**. If no shot of fuel is noted, it is very likely that the pump diaphragm is ruptured or the check valves are stuck; inspect these parts and replace them as necessary.

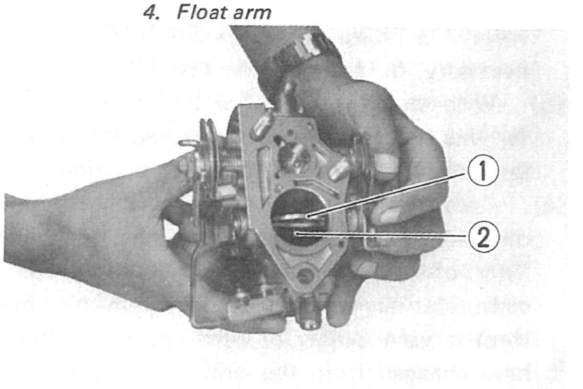

Fig. 6–21 *1. Secondary throttle valve 2. Accelerating pump nozzle*

3. Check the diaphragms—of secondary throttle valve and of unloader—to see if they are in ruptured condition or not. This can be accomplished by pushing down the diaphragm push rod and then putting the face of the thumb against the vacuum inlet hole; releasing the push rod will allow the push rod to rise slowly if the diaphragm is in ruptured condition (it takes a few seconds for the rod to rise all the way); with a sound diaphragm, the push rod stays down. The diaphragm checked to be in ruptured condition must be replaced. **(Fig. 6-22)**

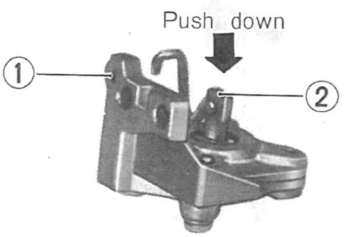

Fig. 6–22 *1. Vacuum inlet hole 2. Diaphragm push rod*

4. Make sure that the fuel or air passages are clear in P.P.A.J., P.P.J., S.P.J., S.P.A.J., P.P.O. and S.P.B. A clogged passage may be cleared by poking through with a **soft-metal** wire substantially smaller in diameter than the passage.
5. Test primary throttle valve, secondary throttle valve and choke valve for smoothness of movement by moving each by hand.

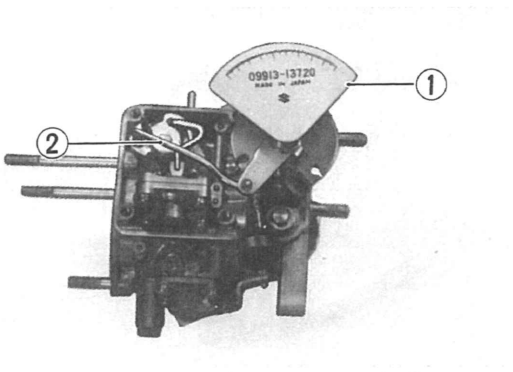

Fig. 6–23 *1. Carburetor angle indicator "B"*
2. Frst idle link

d. Reassembly

Prepare all the removed parts for installation in the carburetor. Those kept in gasoline must be dried by directing clean compressed air against each. Clean the removed diaphragms. Install them by reversing the sequence of disassembly, and adhere to the following instructions concerning the settings of primary and secondary throttle valves, choke valves, accelerating pump and throttle control cable.

(a) Using the **carburetor angle indicator "B" (Tool No. 09913-13720),** check the opening angle of primary throttle valve when choke valve is in "fully closed" position **(Fig. 6.23).** The standard angle is **25.5 ± 0.75°**. Adjust the angle, as necessary, by bending the fast idle link.

(b) With the choke valve kept fully closed, move down the push rod of unloader all the way and see how far this rod movement has caused the valve to open The valve is prescribed to be in the **37.5 ± 0.75°** position; if not, adjust the valve position by bending the unloader link.

(c) Lastly, attach the indicator "B" to primary throttle valve shaft, slowly move the valve in opening direction, and read the valve angle just when the accelerating pump lever begins to move. This is the "start-of-action" angle, prescribed to be **35 ± 5°**. If the reading is off this value, it means that the carburetor has suffered a severe impact or has experienced a drop to a hard floor to distort the primary throttle valve pulley or other parts. Without such an accident, the "start-of-action" angle could not have changed from the original value and, for this reason, the carburetor found to present an off-the-specification angle in this check must be replaced.

(d) After installing the carburetor in place, be sure to set the throttle cables and metering oil pump cable and to adjust the engine idle speed in accordance with the methods and procedures outlined in **GROUP 16-2, 7** and **9.**

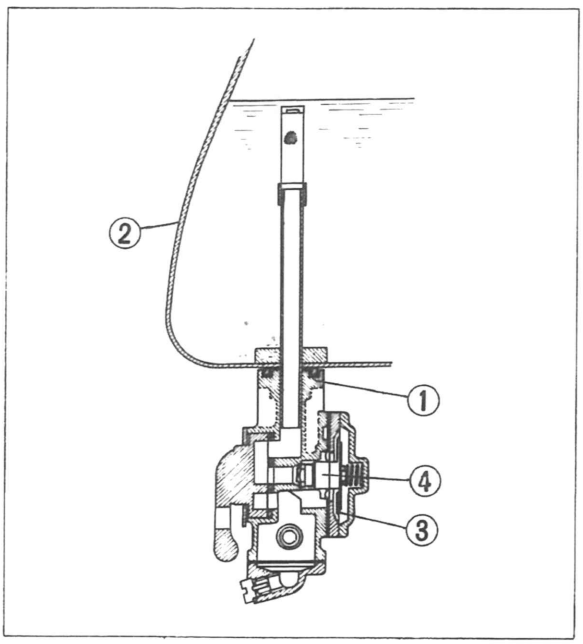

Fig. 6–24 *1. Fuel cock* *2. Fuel tank*
3. Diaphragm *4. Valve*

6-3. FUEL TANK, FUEL COCK AND FUEL LEVEL GAUGE

a. Description

The fuel tank is situated right above the engine, and is rubber-mounted on the frame body. Its fuel cock is below the left-hand part of the tank bottom. The cock is of self-actuating type; it performs its open-close action according to the condition of vacuum present in the intake line, if the cock lever is "ON" or "RES" position. Moving the cock lever into "PRI" position communicates the fuel tank straight to the carburetor, so that the flow of fuel is not affected by the vacuum condition.

In **Fig. 6-24,** the fuel cock is shown in cross section. The vacuum acts on the back of the diaphragm and pulls the valve off its seat to pass fuel to the carburetor. If the engine stops, the diaphragm moves back to close the valve. The additional pipe located between the fuel tank

and the cock is for venting the vapor (developing in the fuel line due to the heat of the engine or of some external source), if any, into the fuel tank.

b. Disassembly

1. Dismount the fuel tank as outlined in **2-2. page 16.**
2. Disassemble the fuel cock and level-gauge tank unit as shown in **Fig. 6-25.**
3. The fuel tank can be disassembled into parts shown in **Fig. 6-26.**

c. Inspection

1. Replace the fuel cock gasket if it is in flaked, or otherwise defective condition. **(Fig. 6-27)**
2. Check the "O" rings for fuel cock and level-gauge unit for condition. Cracked, fatigued or otherwise defective "O" rings must be replaced. **(Fig. 6-27)**
3. Wash the fuel strainer clean, as necessary.
4. Test the diaphragm actuator of the fuel cock in place by using an injector as shown in **Fig. 6-28,** in order to make sure that the diaphragm is in sound condition capable of properly responding to the vacuum. With the cock lever held in "ON" or "RES" position, apply suction to the diaphragm by operating the injector. Pulling the injector plunger should cause fuel to flow out of the hose; if not, the diaphragm is defective.

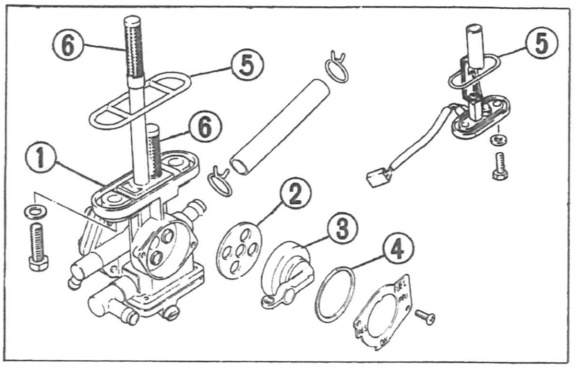

Fig. 6–25 *1. Fuel cock body* *2. Gasket* *3. Fuel cock lever* *4. Spring* *5. "O" ring* *6. Fuel strainer*

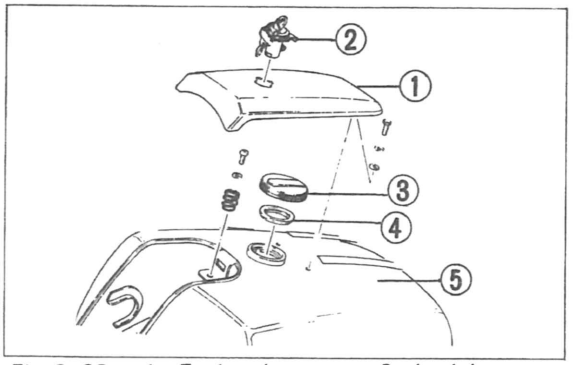

Fig. 6–26 *1. Fuel tank cover* *2. Lock key* *3. Fuel filler cap* *4. Gasket* *5. Fuel tank*

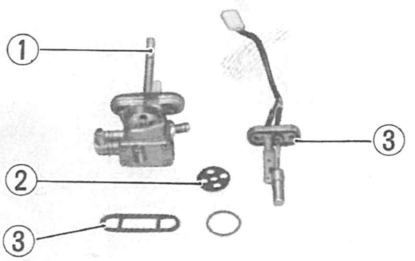

Fig. 6–27 *1. Fuel strainer* *2. Gasket* *3. "O" ring*

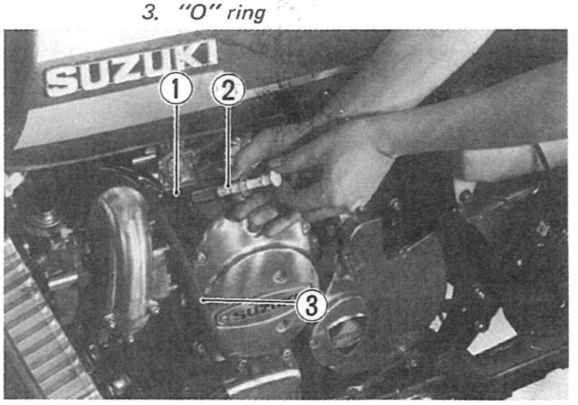

Fig. 6–28 *1. Vacuum hose* *2. Injector* *3. Fuel hose*

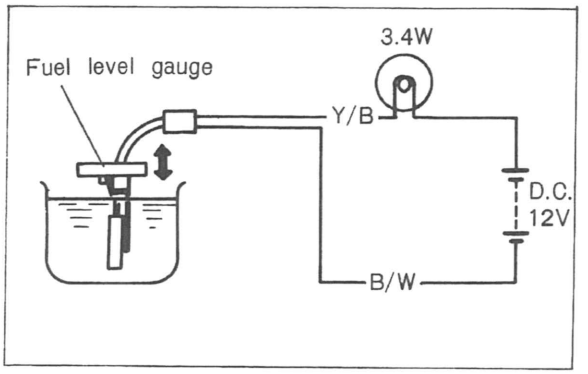

Fig. 6–29 Testing the fuel level gauge

5. Test the level-gauge tank unit as shown in **Fig. 6-29.** Immerse the tank unit in a pool of fuel or plain oil to see if the lamp will go out and lift the unit out of the liquid to see if the lamp will light up. If the lamp comes on and go out in this manner, then the tank unit is in good condition; otherwise the tank unit must be replaced.

Note: When hooking the battery lead wires to the tank unit (which is a thermistor unit), be sure to match the polarity signs. Negative wire connects to the B/W terminal, and positive wire to the Y/B terminal of the tank unit.

d. Reassembly

The reassembling procedures are the reverse of the disassembly procedures.

AIR INTAKE & EXHAUST SYSTEM

GROUP 7

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7-1. GENERAL DESCRIPTION

SPECIFICATIONS

Effective filtration area of air cleaner	240 cm^2
Oil for wetting air cleaner element	R/E oil or SUZUKI CCI oil

TROUBLE-SHOOTING

Symptom	Probable cause	Remedy
Poor high speed operation	1. Air cleaner element too dirty 2. Dirty baffle pipe	Clean or replace Clean or replace
Abnormal exhaust noise	1. Defective exhaust gas seal 2. Cracked or broken	Replace Replace

7-2. AIR CLEANER

a. Description

The air cleaner is located behind the engine and under the seat. Its air inlet is behind the air cleaner body and opens out to the lee side free from the effect of windage during cruising.

The air cleaner element is of foam polyurethane, and is impregnated with oil. Incoming air passes through the polyurethane, and dust particles carried by the air deposit on the oil-wet texture of the polyurethane. **(Fig. 7-1)**

b. Disassembly and inspection

How to disassemble and inspect the air cleaner is described in **GROUP 16-2**.

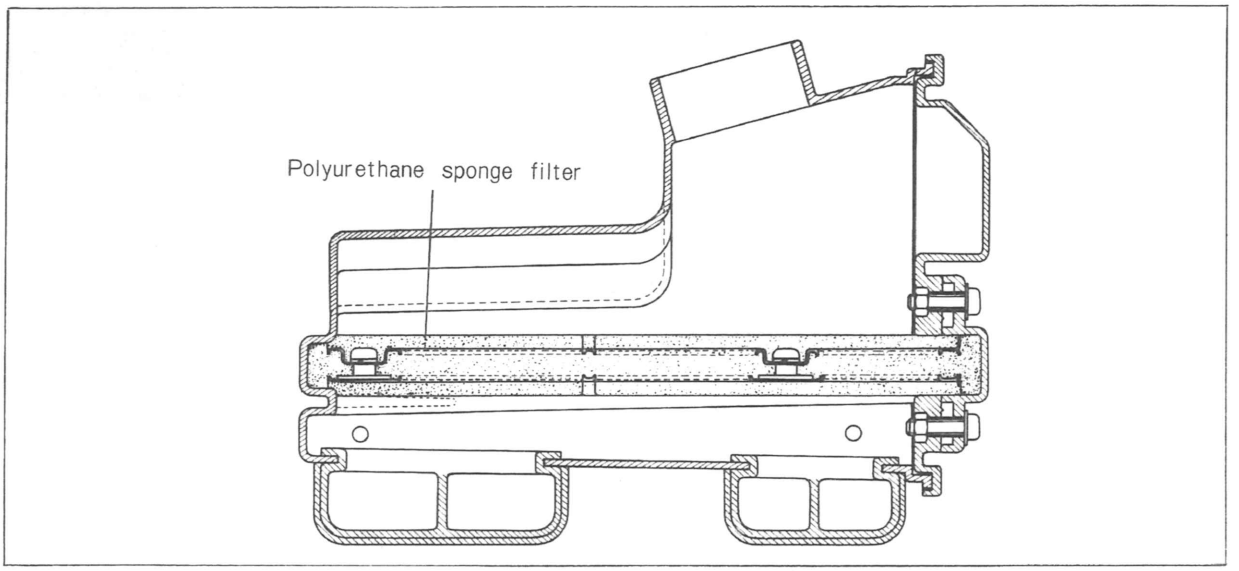

Fig. 7–1

7-3. INTAKE & EXHAUST MANIFOLDS AND MUFFLER

a. Description

The fuel-air mixture coming out of the primary bore of the carburetor flows into the intake manifod, from which it is drawn through two paths into the rotor housing.

The burnt gases are expelled by the engine rotor into the exhaust manifold, in which the gases are divided into two flows, and are discharged to the atmosphere through the two mufflers independent of each other.

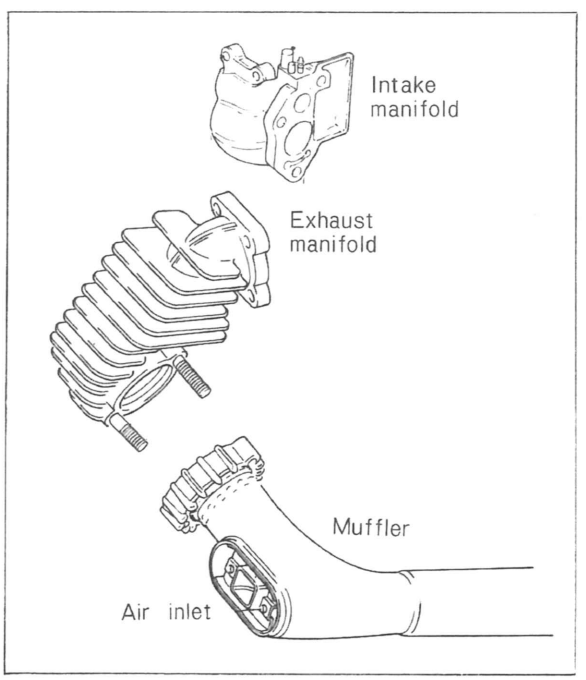

Fig. 7–2

Each muffler is of a double-wall construction, presenting an inner passage and an outer passage surrounding the inner pipe. Combustion gases flow through the inner passage while air, admitted through an inlet hole provided in the forward portion of the muffler, flows through the outer passage to cool off the muffler walls. This arrangement is necessary because the gases coming into the exhaust line are at a relatively high temperature. For any rotary engine, exhaust gases are hotter. For this reason, the exhaust manifold is finned to promote heat dissipation. **(Fig. 7-2)**

IGNITION SYSTEM

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8-1. GENERAL DESCRIPTION

DESCRIPTION

The method by which the spark for igniting the fuel-air mixture is produced in the ignition system of the RE5 motorcycle is termed "Condenser Discharge Ignition," and the electronic device for implementing this method is designated as "C.D. unit."

The C.D. unit receives electric current from the battery and, under the control of the two-lobe and one-lobe cam circuits comprising breaker points, speed relay and vacuum switch, energizes the ignition coil to produce a surge of high-voltage energy for each sparking.

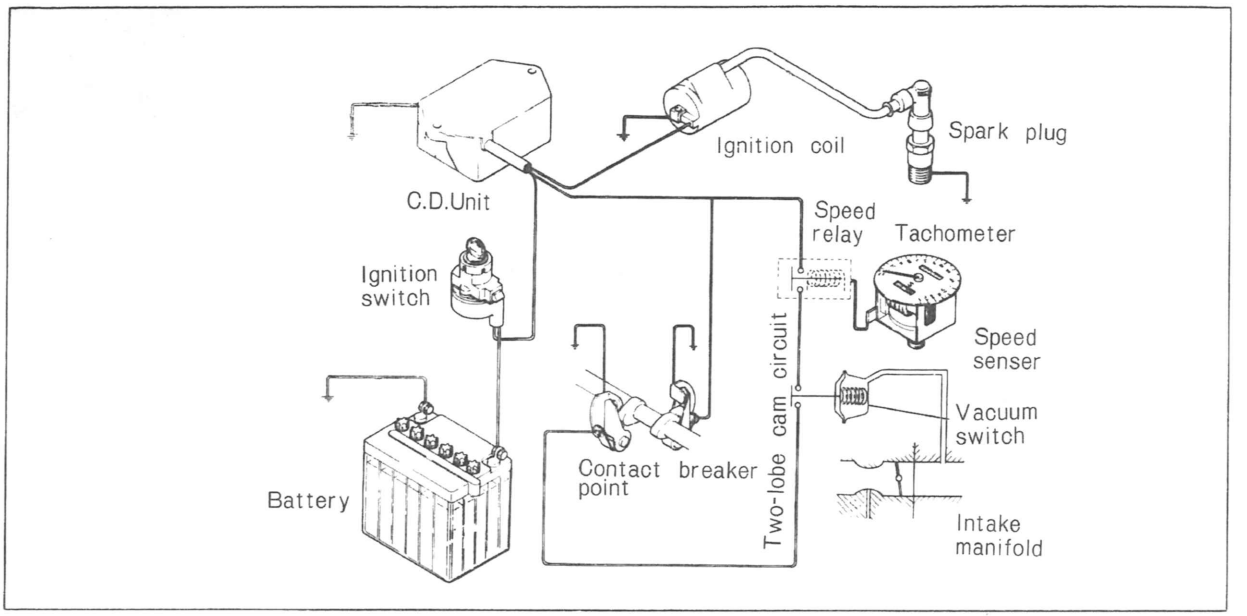

Fig. 8–1

SPECIFICATIONS

C.D. unit	NIPPON DENSO make
Ignition coil	NIPPON DENSO make
Contact breaker spring preload	500 ± 100 grams (1.1 ± 0.22 lb)
Point gap	0.4 ~ 0.5 mm (0.016 ~ 0.020 in.)
Spark plug	A9EFV plug, NGK make, 18-mm thread diameter, 0.55 mm reach
Spark advancer:	
Start-of-advance speed	1400 eccentric shaft rpm
Full-advance speed	5000 eccentric shaft rpm
Advance angle	22 ± 1° of eccentric shaft angle

TROUBLE-SHOOTING

Symptom	Probable cause	Remedy
Engine overheats easily	1. Ignition timing out of adjustment	Adjust
Engine will not fire up in starting	1. Defective spark plug	Replace
	2. Defective ignition coil	Replace
	3. C.D. unit out of order	Replace
	4. Open-circuit or short-circuit in high-tension cord	Replace
	5. Contact breaker point gap out of adjustment	Adjust
	6. Contact breaker point face is dirty	Clean
	7. Open-circuit in low-tension cord	Locate the open point with a circuit tester and replace

Engine misses or runs erratically	1. Vacuum switch inoperative 2. Malfunctioning speed relay 3. High-tension cord is open- or short-circuited	Repair or replace Replace Replace

8-2. C.D. UNIT

a. Description

In the circuit diagram of **Fig. 8-2** in which the ignition system is represented, those devices and circuits surrounded by the dot-line square constitute the hardware of the C.D. unit. This unit is mounted below the battery.

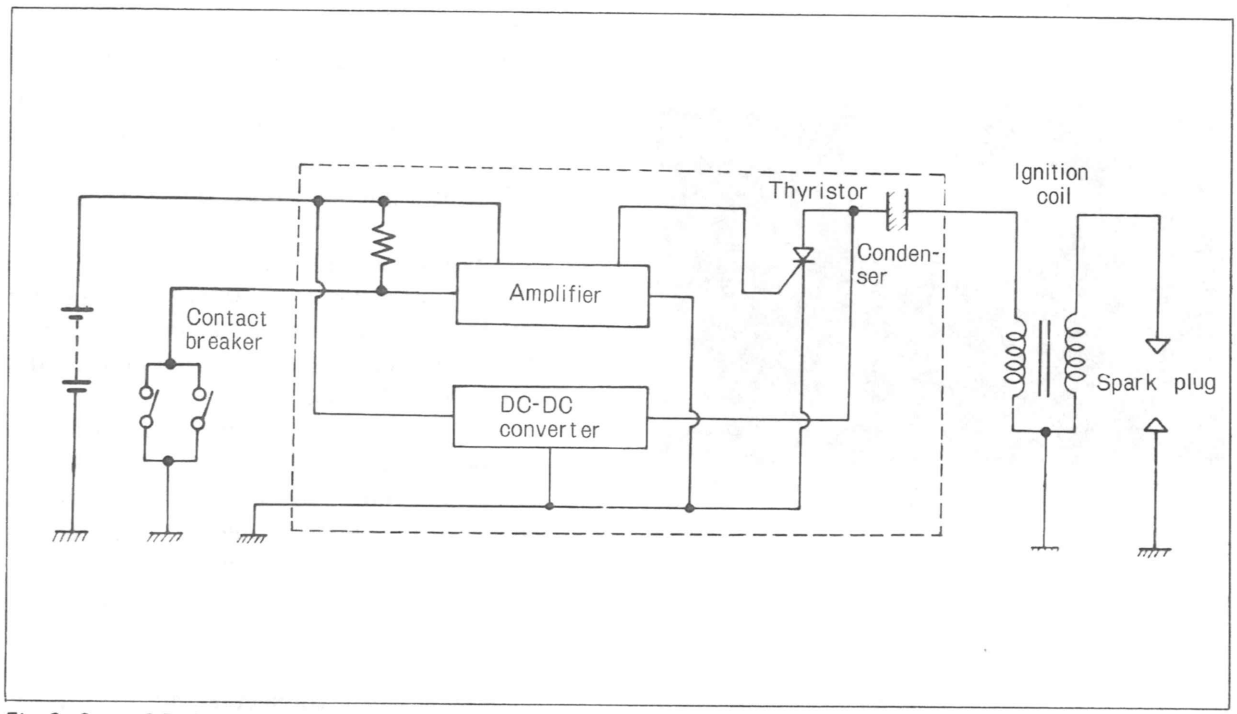

Fig. 8–2 C.D. Ignition circuit

Principal devices in the C.D. unit are the DC-DC converter (which steps up the 12-volt battery voltage to a level between 300 and 400 volts) and the amplifier (which produces the trigger signal to switch on the thyristor). The DC-DC converter charges the condenser, and the thyristor discharges it as controlled by the amplifier. It is the discharge current that flows through the primary winding of the ignition coil to induce a surge of high-voltage energy in the secondary winding.

Two contacts are provided in the contact breaker assembly. The reason why two contacts are used will be explained in **8-7**. How the C.D. unit operates in the system will be explained by assuming that there is only one contact in the breaker assembly.

With the contact closed, a differential voltage applies to the amplifier of the C.D. unit, on account of the resistor connected in series to the contact breaker. As the contact opens, the differential voltage disappears and this change causes the amplifier to produce an amplified voltage signal for triggering the thyristor.

The condenser at this time is in charged condition—charged by the stepped-up output voltage of the DC-DC converter. Triggering a thyristor is like opening a valve. With the thyristor now triggered, a short-circuit is formed to connect the positive side of the charged condenser to the negative side through the primary winding of the ignition coil and the thyristor; a high discharge current flows in

this circuit; and an extremely high voltage is induced in the secondary winding to fly a spark across the gap of the spark plug. As the discharge current dies down, the thyristor becomes non-conductive like a closed valve, and waits for the arrival of another trigger signal.

b. Removal

1. Detach the right-hand frame cover and uncouple the multi-lead connector, which is electrically located between C.D. unit and the rest of the system.
2. Remove the drive chain case and then take out the C.D. unit. Removing two mounting bolts securing the unit allows it to come off from the left side of the machine.

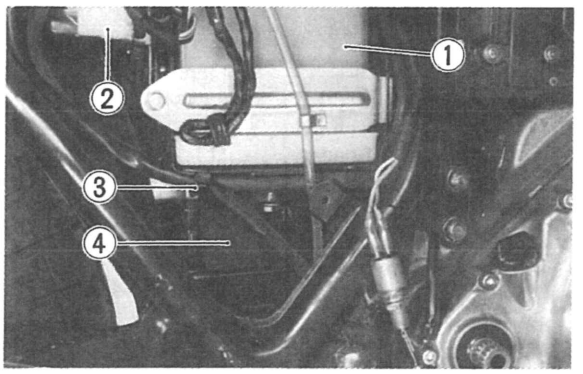

Fig. 8–3 *1. Battery* *2. Multi-lead connector* *3. Clamp* *4. C.D. Unit*

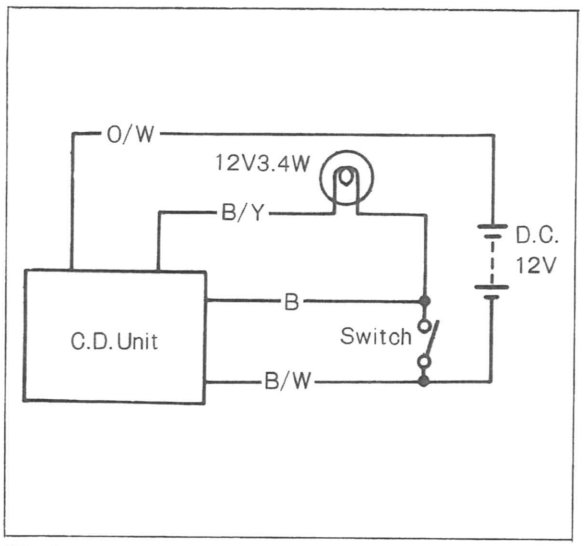

Fig. 8–4 *C.D. Unit check circuit*

c. Inspection

1. Listen into the C.D. unit in place, with the ignition switch turned on. A faint, high-pitch whine will be heard; if not, it means that there is an open somewhere in the wiring. To locate the open, use a circuit tester and trace each run of wire by referring to the circuit diagram (given in **GROUP 17).** The whine comes from the DC-DC converter and is its normal oscillating noise. Such an open is usually in the multi-lead connector. If the connector is in sound condition and if there is no evidence of an open-circuit elsewhere, it means that the C.D. unit is internally open-circuited and needs replacement.
2. The C.D. unit having been verified to be in operable condition in place, carry out a bench test to check for spark-producing performance by connecting the unit to the test circuit, as shown in **Fig. 8-4.**

   The switch in the test circuit simulates the breaker contact. Operate the switch on and off several times to see if the lamp lights each time the switch is **opened.** If it does, the C.D. unit is in good condition; if not, replace the unit. Remember, the lamp will not remain on; it burns with the discharge current and goes out a moment later.

   Caution: When connecting the B/Y (black with yellow tracer) lead wire, be careful not to touch the ground with this wire or the element inside the C.D. unit may get destroyed. For the lamp, use the same type of bulb as the 3.4-watt indicator lamp used in the machine. If a spare 3.4-watt bulb is not available, use a smaller bulb.

d. Installation

Reverse the removal procedure to install the C.D. unit.

8-3. IGNITION SWITCH

a. Description

The ignition switch has four positions: **"OFF", "CHECK", "ON"** and **"P".** In "OFF" position, the switch disconnects the rest of the system from the battery. In "CHECK" position, the switch passes current to oil pressure indicator lamp, fuel level indicator lamp and metering oil level indicator lamp and also to all other electrical loads including head lamps, turn signal lamp, temperature gauge and the like

but not including the tail lamp.

In "ON" position, the switch closes all circuits to make the motorcycle electrically turned on; its engine can be started; and all instruments and lights work in the usual manner. The switch remains in this position when the motorcycle is on the cruising run.

In "P (for PARKING)" position, the switch turns on the tail lamp to declare the parked condition of the motorcycle to the traffic on the road.

b. Inspection

Use a circuit tester for checking the ignition switch. To be checked are circuit continuity and discontinuity for each switch position. The chart below shows the schedule of internal switching actions; **Fig. 8-5** illustrates the method of using the tester:

Switching schedule

Switch position	Colors of terminals (wires)								
	R	R/Y	O	Gr	Br	B1/W	Y/B	G/R	B/W
OFF									
CHECK	○		○			○	○	○	○
ON	○	○	○	○	○				
P	○				○				

Note: Symbols are used in these senses:

An interconnecting line, ○——○, means continuity.

R = red
O = orange
Gr = gray
Br = brown
R/Y = red with yellow tracer
B1/W = blue with white tracer
Y/B = yellow with black tracer
G/R = green with red tracer
B/W = black with white tracer

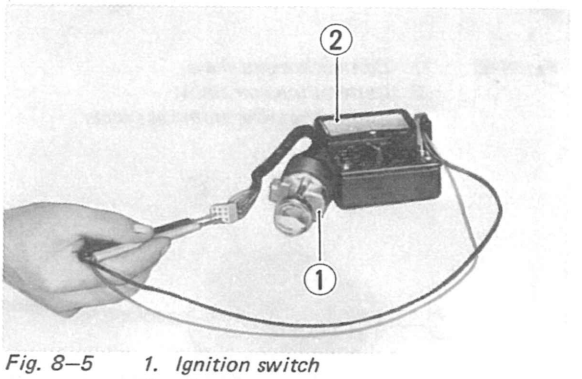

Fig. 8–5 1. *Ignition switch*
2. *Circuit tester*

8-4. CONTACT BREAKER ASSEMBLY

a. Description

This assembly is mounted on the crankcase; its location is to the right of the engine. Its shaft, driven from eccentric shaft, is complete with an advancer mechanism of centrifugal type and has its end portion formed into two cams, one having only one lobe and the other having two lobes. **(Fig. 8-6)**

For a skeleton description of the advance mechanism, the breaker shaft may be likened to two distinct shaft sections fitted end to end and held rigidly by spring-restrained centrifugal weights. The flyweights expand or contract—see **Fig. 8-7**—according as the engine runs fast or slow. When they expand, they "twist" the cam-carrying shaft section relative to the other section,

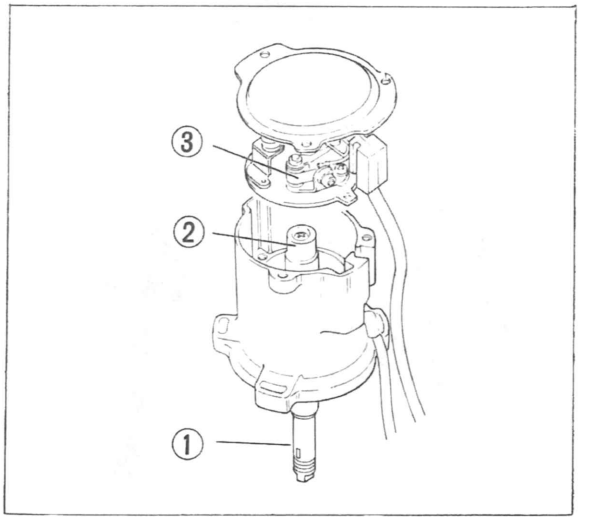

Fig. 8–6 1. *Contact breaker shaft*
2. *Contact point cam*
3. *Contact breaker point*

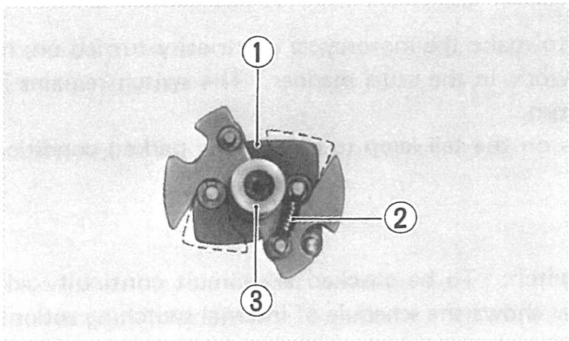

Fig. 8–7 . 1. *Advancer weight*
2. *Advance weight spring*
3. *Contact point cam*

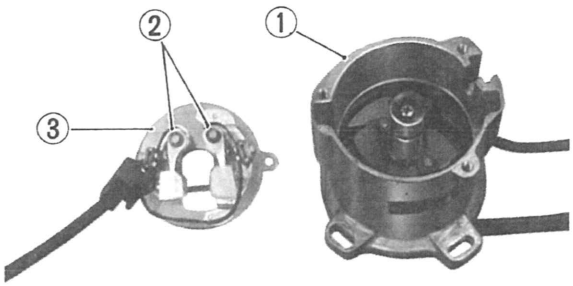

Fig. 8–8 1. *Contact breaker case*
2. *Contact breaker point*
3. *Contact breaker point set plate*

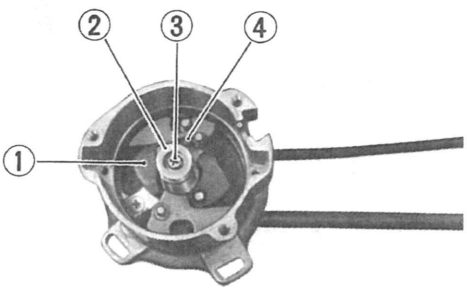

Fig. 8–9 1. *Advancer weight*
2. *Contact point cam*
3. *Screw*
4. *Advancer weight spring*

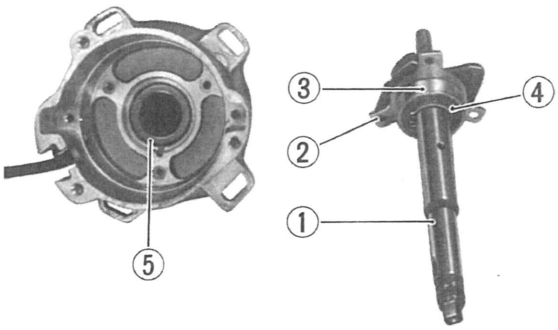

Fig. 8–10 1. *Contact breaker shaft*
2. *Ball bearing retainer*
3. *Ball bearing* 4. *Circlip*
5. *Oil seal*

thereby advancing the phase or angular position of the cam with respect to the eccentric shaft.

b. Disassembly

1. Remove the clutch cover as outlined in **2-2, pages 9 to 11.**
2. Remove the contact breaker assembly. The procedure is set forth in **5-3, pages 47 to 48.**
3. Detach the contact breaker cover by loosening the three screws securing the cover and remove the contact points. These points are secured by screws. Loosen the two screws fastening down the contact point set plate, and take off the plate. **(Fig. 8-8)**
4. Unhook each advancer weight spring, take out the springs, loosen the set screw on the contact point cam and take out the cam. **(Fig. 8-9)**
5. Loosen the three screws retaining the bearing inside the breaker body, and draw out the breaker shaft. **(Fig. 8-10)**
6. Remove the circlip retaining the ball bearing, and take out the bearing. **(Fig. 8-11)**

c. Inspection

1. Inspect the sliding surfaces of each advancer for rusting. Remove the rust, if any, by polishing with sandpaper and coat the surfaces lightly with grease.
2. Examine the weight springs for signs of cracking. Replace cracked or broken springs.
3. Visually examine the interior of the contact breaker body to see if any R.E. oil has entered there. Presence of the oil in the breaker body means that its oil seal is leaky and needs replacement.
4. Check the contact breaker points as outlined in **16-2, page .**

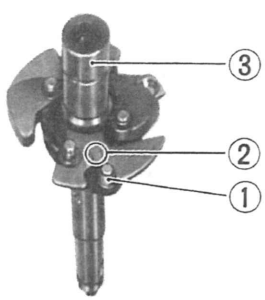

Fig. 8–11 1. *Roller* 2. *"11" mark*
3. *Contact point cam*

d. Reassembly

The sequence of steps is the reverse of the disassembly, and is to be carried out by observing the following points:

(a) When installing the contact breaker cam, be sure to bring the roller on the advancer weight plate into the notch marked **"11"** (the value of advance angle). The weight spring may be hooked to either weight. Make sure the spring in place does not touch the "E" ring retaining the weight. **(Fig. 8-11)**

(b) Before fitting the contact breaker cam onto the shaft, apply grease liberally to that portion of the shaft for carrying the cam. **(Fig. 8-12)**

(c) Adjust the contact point gap and set the ignition timing as outlined in **16-2.**

(d) When mounting the contact point set plate on the breaker body, be sure to bring the rounded edges (indicated in **Fig. 8-13)** into register.

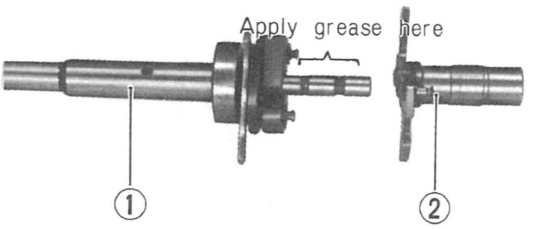

Fig. 8–12 *1. Contact breaker shaft*
2. Contact point cam

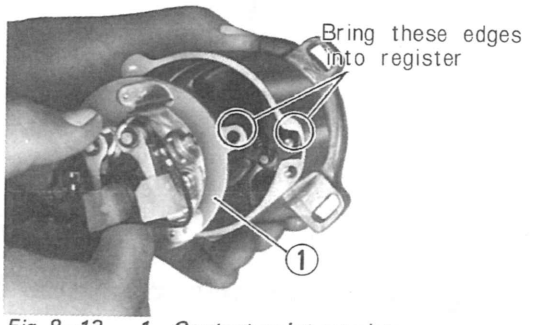

Fig. 8–13 *1. Contact point set plate*

8-5. IGNITION COIL

a. Description

The ignition coil is below the fuel tank, and is secured to the frame by screws. It is of a type specially designed for use in the C.D. ignition system, and has its primary and secondary coils wound in the numbers of turns presenting a turn ratio which is at wide variance with the ratios found in ordinary ignition coils.

b. Removal

1. The fuel tank must be taken down to permit removal of the ignition coil. The procedure of removing the fuel tank is outlined in **2-2, page 9.**
2. Disconnect the low-tension (primary) cord and high-tension (secondary) cord from the spark plug. Remove the two screws securing the coil, and take out the oil.

c. Inspection

1. Check the ignition coil for continuity with a circuit tester as shown in **Fig. 8-14.** The coil is in good condition if it presents about 1 ohm for primary winding and about 1.5 kilohms for secondary winding.
2. Inspect the mounting part of the ignition coil for grounding. Make sure a good metal-to-metal contact will result when the coil is set in place. Rust, if any, must be removed with emery cloth. Be sure that the seat on the frame too is clean of rust.

Fig. 8–14 *1. Ignition coil*

d. Installation

Install the ignition coil by reversing the removal procedure.

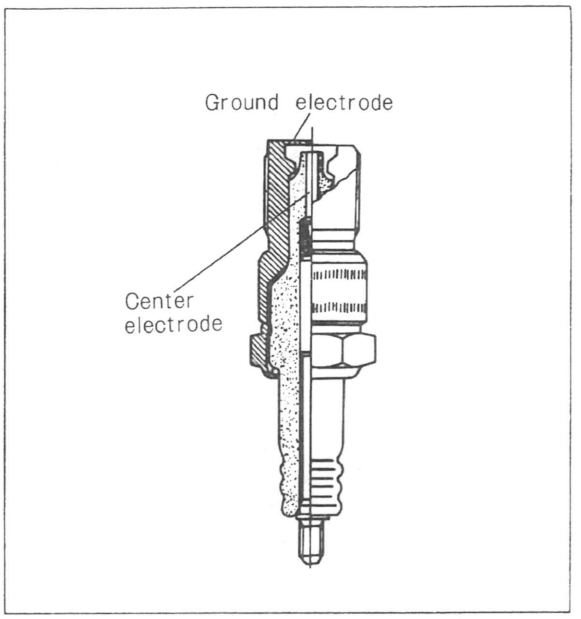

Fig. 8–15 Spark plug

8-6. SPARK PLUG

a. Description

The plug used in the present engine is considerably different from those hitherto used, in that it seats in place without any gasket and that its electrodes are slender. A rare metal is used in the electrodes to facilitate sparking.

The neck portion of the plug is tapered as shown in **Fig. 8-15.** By this tapered face, the plug seats gas-tight and, by this feature, assures the electrodes to come to the exact position relative to the combustion chamber. If a gasket were used, the position of the electrodes would change as the gasket becomes thinner.

The plug specification is **NGK A9EFV.** Be sure that every replacement plug has this designation. It is a wide heat range plug and, as such, enhances the capability of the present rotary engine.

8-7. ENGINE SPEED SENSER, RELAY AND VACUUM SWITCH

a. Description

As will be noted in **Fig. 8-1,** the cam with one lobe actuates a contact point connected in series to the vacuum switch and speed relay, and this circuit (one-lobe cam circuit) is paralleled by another (two-lobe cam circuit). Since the cam shaft (breaker shaft) rotates half as fast as the eccentric shaft and an ignition takes place for each eccentric shaft rotation in the engine, it would appear that the two-lobe cam and its contact point are all that is needed for the engine.

Again referring to **Fig. 8-1,** suppose the one-lobe cam circuit is completed while the engine is running. Then, in the contact breaker, **effective** contact breaking occurs only once, not twice (as when only the two-lobe cam circuit is in service), for each breaker shaft rotation, and this will cause the engine to "fire" and "misfire" alternately. This deliberate "missing" is calculated to assure complete scavenging of exhaust gases and positive ignition of fuel-air mixture in **every other** chamber coming to the spark plug, under certain operating conditions of the engine. During normal engine operation, it is the two-lobe cam circuit which initiates normal ignition.

The certain conditions mentioned above may be called "high-speed high-vacuum" conditions, which occur when the rider suddenly squeezes the throttle grip while on full-speed cruizing. The speed relay closes its contact when engine speed rises to and above 1700 rpm. The engine speed senser, whose output signal actuates the relay, is built in the tachometer; the relay is located below the fuel tank.

The vacuum switch, mounted beyond the off side of the carburetor, is acted on by the vacuum existing in the intake line, downstream of the throttle valve.

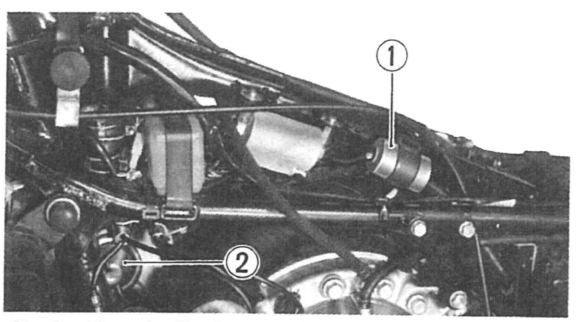

Fig. 8–16 1. Engine speed relay 2. Vacuum switch

b. Removal

1. Remove the fuel tank as outlined in **2-2, page 9.**
2. Uncouple the multi-lead connector and ease out the speed relay **(Fig. 8-16).**
3. Remove the two mounting bolts securing the vacuum switch, disconnect the vacuum hose from the intake manifold, and take out the switch.

c. Inspection

1. Check the contact breaker sub-system as a whole for operation after the machine has been reassembled and made ready for starting the engine for the first time. The procedure is as follows:

   Remove the contact breaker cover, and connect the voltmeter to the outer contact point, as shown in **Fig. 8-17.** This is for reading voltage on the one-lobe cam circuit. Start up the engine, after idling it for some time, pick up speed gradually to about 4000 rpm. At this speed level, snappily turn back the grip to zero-throttle position and observe the voltmeter indication.

   The moment the grip comes to zero-throttle position, the voltmeter hand should jump to indicate about 6 volts and, as engine speed falls, the voltmeter indication should return to 0 volt just when the speed reaches a level of about 1700 rpm. If the voltmeter indication changes in this manner, then the speed relay and vacuum switch may be judged to be in sound condition; if not, investigation must be extended into each device for determination of the cause.

2. Check the engine speed senser as follows: Remove the head lamp unit from the lamp housing by removing the three securing screws; turn on the ignition switch; and read the input voltage of the speed senser. The voltmeter should indicate about 12 volts for this voltage, which shows up between **G/Y** lead (coming from the speed relay) and **G/W** lead and can be checked at these leads when their connectors are uncoupled. **(Fig. 8-18)**

   Next, re-connect the **G/W** lead, and insert a milliammeter in the **G/Y** lead as shown in **Fig. 8-19.** Run the engine and raise and lower its speed through the **1600 ~ 1800 rpm** range to see if the milliammeter indication changes from about 9 mA to about 5 mA and vice versa for the rise and fall, respectively, through that range. If the indication does not change at all or remains at 0 mA, the tachometer assembly must be replaced.

3. Check the speed relay for switching operation at the bench, connecting the relay in the test circuit arranged as shown in **Fig. 8-20.** Note that the circuit tester is inserted between C.D. unit side and vacuum switch side

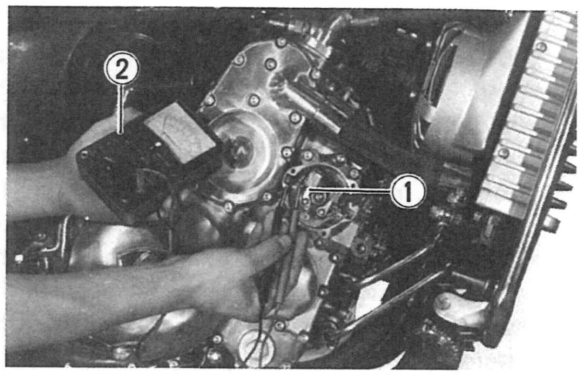

Fig. 8–17 1. Contact point (one-lobe cam circuit) 2. Voltmeter

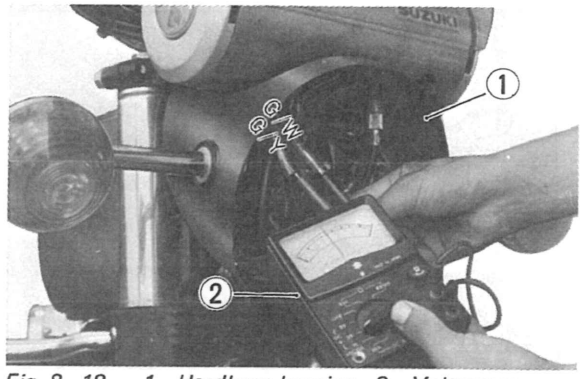

Fig. 8–18 1. Headlamp housing 2. Voltmeter

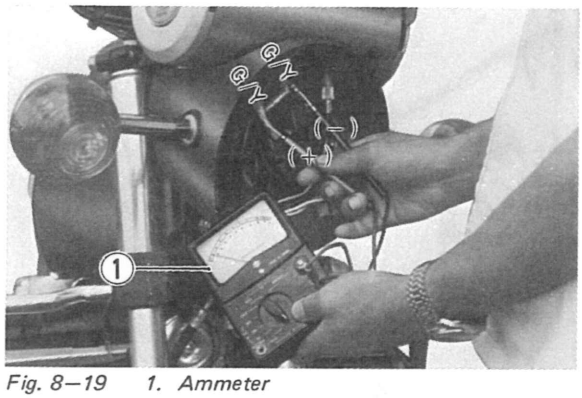

Fig. 8–19 1. Ammeter

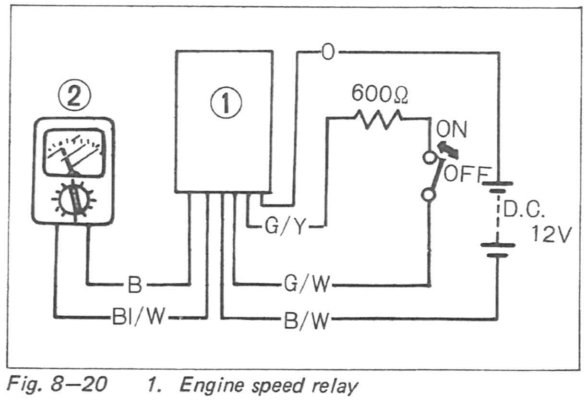

Fig. 8–20 1. Engine speed relay 2. Circuit tester

(between B lead and **B/W** lead), and that a **600-ohm** resistor is inserted between **G/Y** lead and **G/W** lead, in series to a switch. With the 600-ohm resistor disconnected (by opening the switch), the circuit tester should indicate inifinity, meaning that the contact within the relay, is open; with the switch close, the tester should indicate nearly 0 ohm to mean that the contact is closed. If closing and opening the switch does not result in any change in the tester indication, the relay is obviously inoperative and must be replaced.

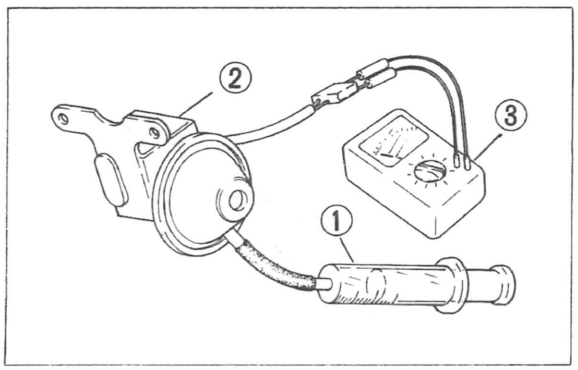

Fig. 8–21 1. Injector 2. Vacuum switch 3. Circuit tester

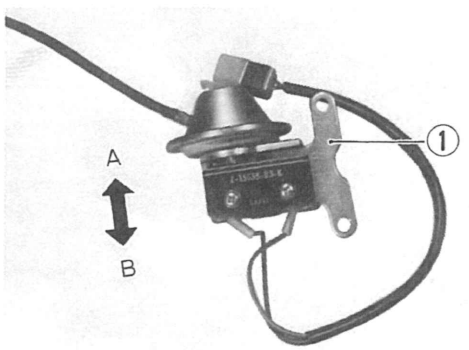

Fig. 8–22 1. Vacuum switch

Note: When connecting lead wires to the battery, be careful not to connect the 0 lead to the negative terminal of the battery or the diodes within the relay may become ruptured.

4. Check the vacuum switch for switching operation at the bench, by connecting the circuit tester to its terminals, as shown in **Fig. 8-21.** Fit the injector to the vacuum hose, and operate its plunger to see if the switch issues forth a clicking sound when vacuum is applied. With this clicking sound, the tester indication should change from infinity to some ohmic value, evidencing the closure of the contact inside the switch.

The vacuum switch permits adjustment of its vacuum setting – the level of vacuum at which it operates. This is accomplished by removing the two screws, shown in **Fig. 8-22,** and by displacing its switching part upward (to raise the level) or downward (to lower the level). Upward and downward directions are represented by "A" and "B", respectively, in **Fig. 8-22.**

The setting is too low if, during the test run of **1,** any voltage is indicated by the voltmeter when the speed relay closes its contact (at about 1700 rpm of rising engine speed). Conversely, the setting is too high if, during the same test run, the voltmeter indication remains at 0 volt when the throttle grip is rapidly squeezed all the way after the speed relay has closed its contact.

The checks of **3,** and **4,** above, are to be carried out before installing the speed relay and vacuum switch in place.

CHARGING SYSTEM

GROUP 9

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9-1. GENERAL DESCRIPTION

DESCRIPTION

The charging system in the RE5 motorcycle is made up essentially of a 3-phase alternator of excited field type, complete with a rectifier unit for changing the 3-phase output to a DC output, the voltage regulator and the fuse.

In the alternator, the armature (stator coils) and field coil are stationary. The rotor (presenting a number of magnetic poles) is in the shape of a pot with a center boss, and is mounted on the eccentric shaft in such a way that its magnetic pole part revolves through the annular space between the stator coils and the field coil. Unlike alternators of similar types, this alternator has neither slip rings nor brushes. Field excitation current is directly supplies to the field coil.

To maintain the output voltage at a constant level, the exciting current to the field coil is regulated by the dual-contact voltage regulator. The rectifier unit consists of silicon rectifier elements. It is by the DC current available from the rectifier unit that the battery is recharged.

In the circuit diagram of **Fig. 9-1,** it will be noted that, with the alternator running and the ignition switch closed, the battery is in floating operation: the battery receives energy from the rectifier unit and delivers load currents, one of which is the field excitation current.

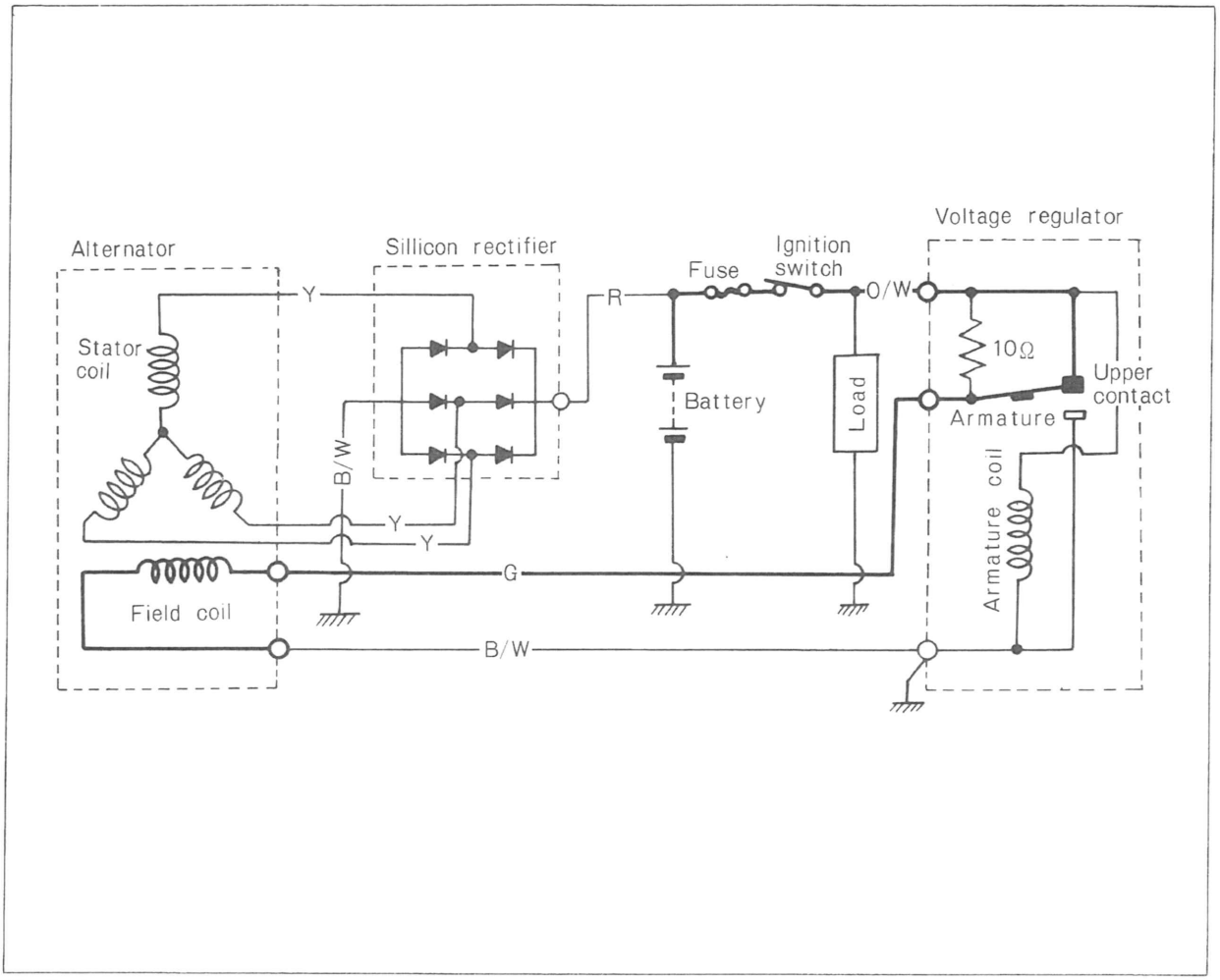


Fig. 9–1

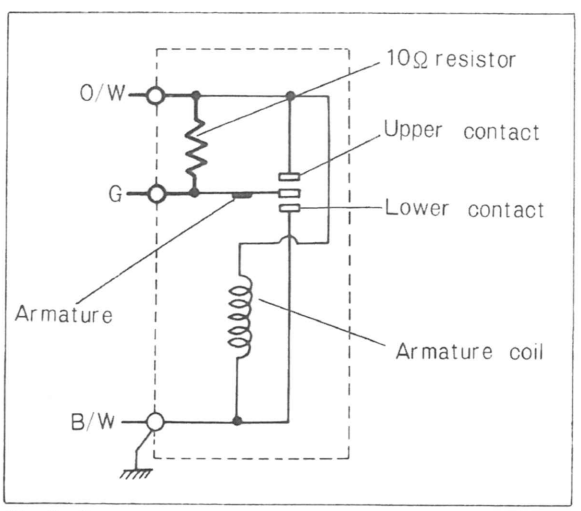


Fig. 9–2

Field excitation current flows through the voltage regulator and the field coil of the alternator. In the voltage regulator, this current has two possible paths. When its contact-point-carrying armature is up against the upper contact point, the current encounters little or no resistance in the regulator and flows into the field coil. This current is relatively large, so that the alternator output voltage is high. This is an operating condition under which the battery terminal voltage is lower than 13.5 volts and is in need of a large charging current.

A rise of battery terminal voltage to and above 13.5 volts or so causes more current to flow in the armature coil of the regulator than before, so that the coil pulls the armature away

from the upper contact point. Consequently, the field current has to flow through the 10-ohm resistor. This is another operating condition under which the battery needs less charging current. **Fig. 9-2** shows the armature being held off the upper point.

The field current is about 0.8 ampere under the above condition. Even with this much current, the output voltage would be very high if the engine ran fast. In such a case, the armature coil pulls the armature down to the lower contact, as shown in **Fig. 9-3,** so that the current flows through the 10-ohm resistor into the ground (B/W line). No field current flows in the field coil of the alternator. This is still another operating condition under which the battery terminal voltage is at or above 14.5 volts, a level so high that the battery needs no charging current at all.

To sum up, the voltage regulator alters the path of field excitation current in response to the battery voltage.

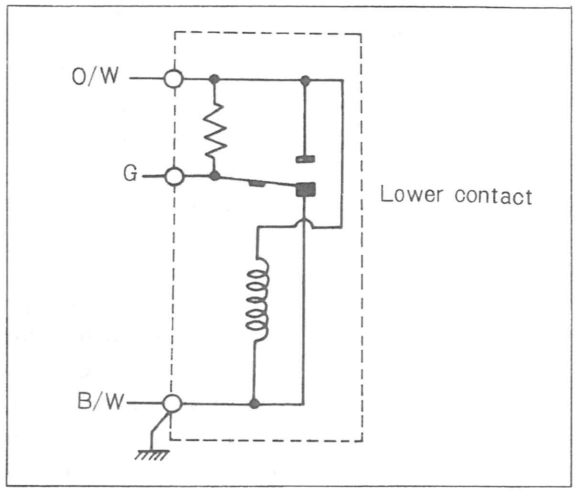


Fig. 9–3

SPECIFICATIONS

ALTERNATOR	NIPPON DENSO make
Battery voltage	12 volts
Output	280 watts at 5000 rpm, 100°C (212°F)
Polarity	Negative (–) ground
Weight	4.4 kg (9.68 lb)
VOLTAGE REGULATOR	NIPPON DENSO make
Point gap	0.3 ~ 0.4 mm (0.012 ~ 0.016 in.)
Resistor	10 ohms
Weight	0.22 kg (0.49 lb)
SILICON RECTIFIER	NIPPON DENSO make
Output	12 volts, 20 amperes
Weight	0.18 kg (0.40 lb)

TROUBLE-SHOOTING

Symptom	Probable cause	Remedy
No charging current to the battery	1. Open or short in the circuit wire, or loose connection	Repair or replace, or retighten
	2. Ruptured silicon diodes in the rectifier unit	Replace
	3. Defective winding in the alternator	Replace the alternator
	4. Open or short in the circuit within voltage regulator	Repair or replace
	5. No-load voltage setting is too low in the voltage regulator	Adjust

Not enough charging current	1. Layer short-circuit in the field coil or stator winding	Replace the alternator
	2. One of stator windings is shorted	Replace the alternator
	3. Some of silicon diodes are in ruptured condition	Replace
	4. Loose wiring connection	Repair and retighten
	5. Voltage setting too low in the voltage regulator	Adjust
	6. Point faces are dirty or pitted or roughened in the voltage regulator	Clean and smoothen
	7. Internal short-circuit in the armature coil or resistor of the regulator	Replace
	8. Electrolyte is down in the battery	Add distilled water
	9. Deteriorated cell plates in the battery	Replace the battery
Excessive charging current	1. The battery is internally shorted	Replace
	2. Voltage setting too high in the voltage regulator	Adjust
	3. Open in the grounding circuit of the voltage regulator	Repair
	4. Open in the armature coil lead wire in the voltage regulator	Repair or replace
Charging voltage unstable	1. A circuit wire is locally stripped of its insulation, exposing the conductor naked in intermittent contact with ground; or a wire is broken, with the broken ends touching each other intermittently	Repair or replace
	2. Layer short or intermittent shorting in alternator field coil or armature winding	Replace the alternator
	3. Intermittent opening of circuit within armature coil of voltage regulator	Replace
	4. Contact point faces are dirty in the voltage regulator	Clean and smoothen

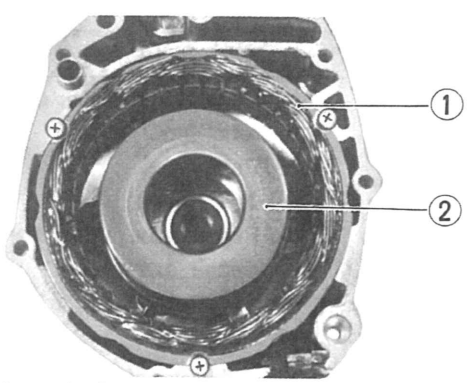


Fig. 9–4 1. Stator coil 2. Field coil

9-2. ALTERNATOR

a. Description

The field coil is secured to the alternator cover. The rotor is mounted, by its center boss portion, on the eccentric shaft. The armature, or stator coils, surrounds the magnetic pole part of the rotor which, in turn, surrounds the field coil.

b. Disassembly

1. Remove the generator cover and alternator rotor, as outlined in **2-2, pages 9** to **11.**
2. Remove the three screws securing the stator coils to the back of the generator cover, and take off the coils. **(Fig. 9-4)**

3. The field coil can be removed when its three securing screws are off. **(Fig. 9-5)**

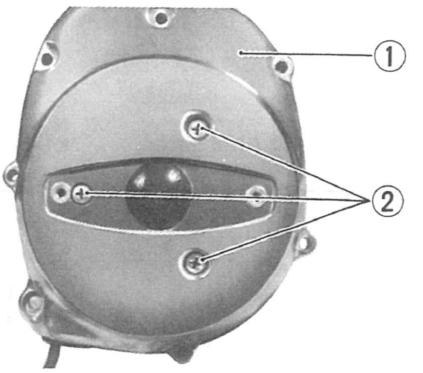


Fig. 9–5 *1. Generator cover*
2. Field coil fixing screw

c. Inspection

1. Field Coil:

Check the coil for open- and short-circuit by using a circuit tester, as shown in **Fig. 9-6.** with one of the tester pins put to the surface of the field coil assembly and the other pin touching the terminating end of the coil (B/W wire or G wire), the tester should indicate infinity (to mean that the coil insulation is in good condition). With one tester pin touching one end and the other pin touching the other end of the field coil **(Fig. 9-6)**, the tester should indicate about 5 ohms (to mean that the coil is in sound condition, free from any layer short-circuit). If the tester indication is otherwise, it means that the field coil is defective and needs replacement.

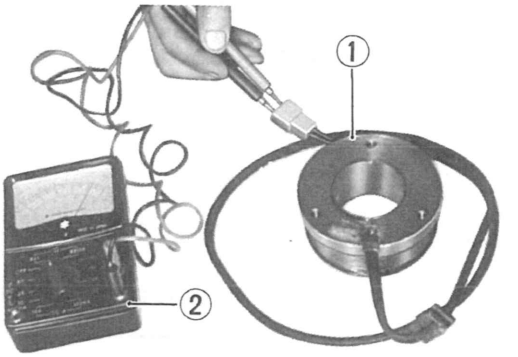


Fig. 9–6 *1. Field coil* *2. Tester*

2. Stator Coils:

Check each coil in the same manner as for the field coil. Stator coils have but very small ohimic resistance and the tester will indicate a small fraction of an ohm. **(Fig. 9-7)**

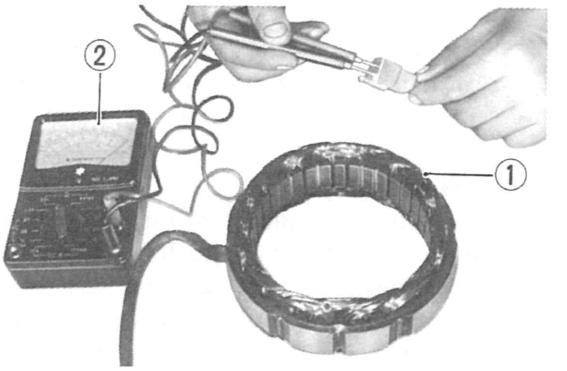


Fig. 9–7 *1. Stator coil* *2. Tester*

3. Rotor:

A distorted rotor must be replaced. Such a rotor is evidenced by rubbing marks on field core and stator core.

4. No-load Voltage Test on Alternator:

The no-load test is for ascertaining the condition of the stator windings, and is more effective than the method outlined in **2. Stator Coils.** The test is carried out with the alternator in place. The test circuit is as shown in **Fig. 9-8.**

The procedure is as follows:

(1) Start up the engine and run it for five minutes to warm it up.

(2) Run in the idle adjust screw on the carburetor to raise the engine speed gradually and read the voltage at 1500 rpm, 2000 rpm and 2500 rpm. Hold the engine speed at each of these levels to take a voltage reading.

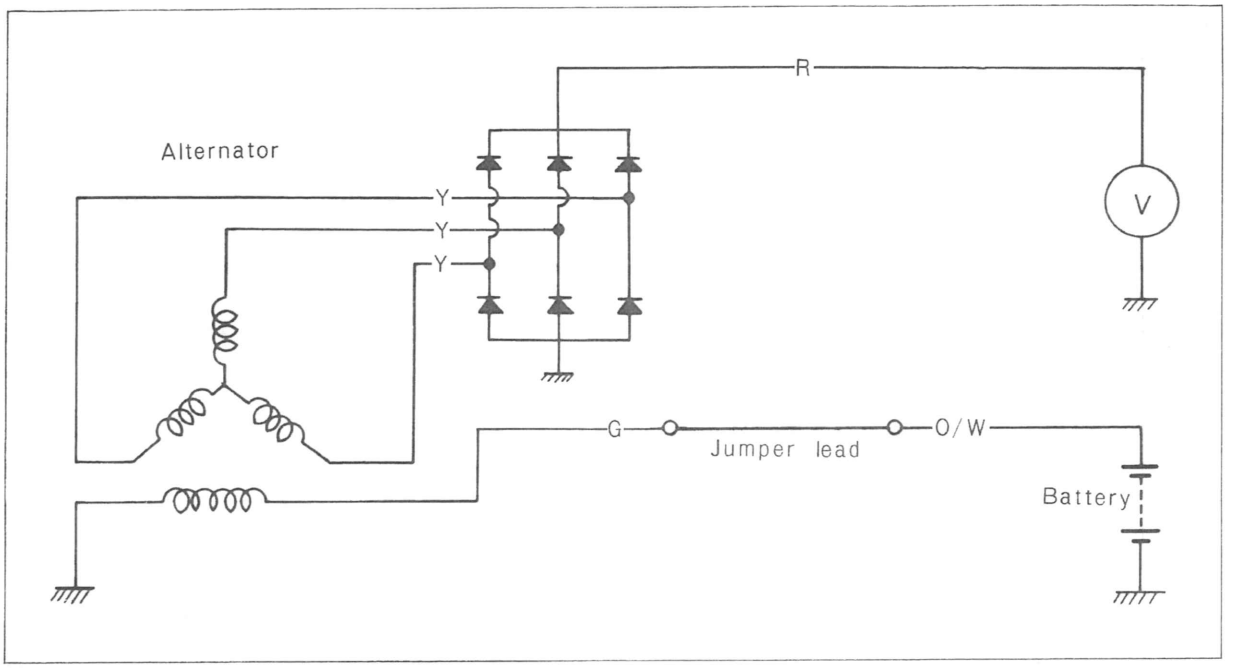


Fig. 9–8

(3) Compare the three readings against this list:

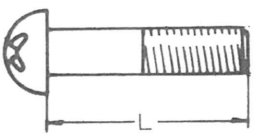
Engine speed	1500 rpm	2000 rpm	2500 rpm
Voltage	24 volts	34 volts	40 volts

If the three readings are less than the corresponding values listed above, then the stator coils are in defective condition and it is most likely that its insulation has failed to result in "short-circuit through layer between turns." Such a stator must be replaced.

d. Reassembly

Reverse the sequence of disassembly work to put the alternator back to the original state. When installing the field coil, be sure to use 25-mm long securing screws. Using screws longer than 25 mm in "L" dimension is likely to damage the field coil.

Note:



Screw length "L"

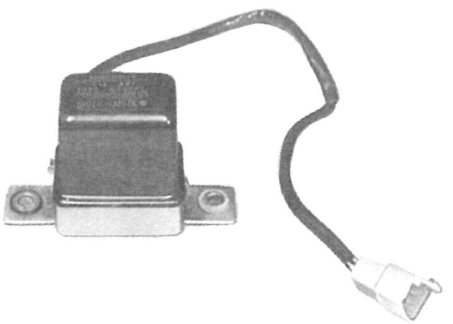


Fig. 9–9 Voltage regulator

9-3. VOLTAGE REGULATOR

a. Description

The voltage regulator has two contact points and a point-carrying armature, by means of which it provides three selective ways of controlling the field current for the alternator. The armature coil for magnetically pulling the armature is energized by a current whose magnitude is dependent on the battery voltage.

When the terminal voltage of the battery is low, the magnetic pull developed by the coil is relatively small, so that the armature point is in

contact with the upper point to pass a large field excitation current. As the battery voltage rises, the coil pulls the armature away from the upper point to cut in the 10-ohm resistor into the path of field current. This reduces the field current and lowers the alternator output voltage. As the battery voltage rises further, the armature point touches the lower point to ground the field coil; under this condition, the alternater generates voltage by residual magnetization in its field. **(Fig. 9-9)**

b. Disassembly

1. Remove the right-side frame cover and disconnect the lead wires from the alternator. **(Fig. 9-10)**
2. Remove the two bolts securing the voltage regulator to the battery holder, and take off the regulator.
3. Peel off the sealing plastic from the regulator cover seat, bend the plate at the seating part, and remove the cover.

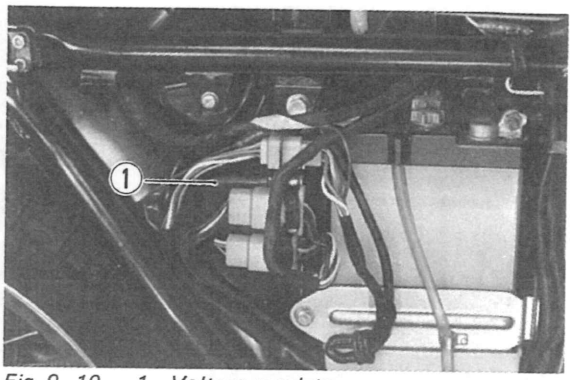


Fig. 9–10 1. Voltage regulator

c. Inspection

1. Resistor:

With the armature held in floating condition between the two stationary points, check for continuity between G (green) lead wire and O/W (orange with white tracer) lead wire. Use the circuit tester as shown in **Fig. 9-11.** The 10-ohm resistor is between these two wires, and the tester will indicate about 10 ohms to tell that there is no open in this circuit.

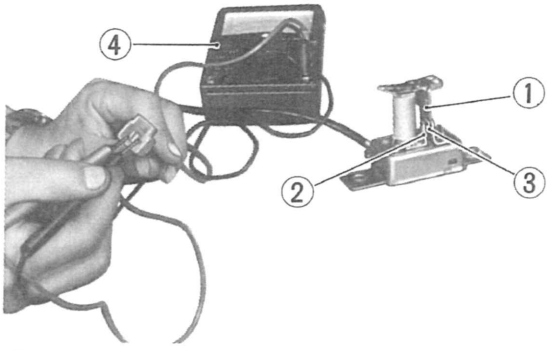


Fig. 9–11 1. Armature 2. Upper contact 3. Insulator 4. Tester

2. Armature Coil:

Check the armature coil for open with the circuit tester. Put the tester probe pins to O/W and B/W lead wires. It will show about 90 ohms if the coil is in sound condition, that is, free from any open.

3. Point Gap Adjustment:

Inspect the contact point faces. If they are dirty, roughened or pitted, smoothen them by grinding with a fine-grade emery cloth. Measure the point gap with a thickness gauge; if the reading is off the standard range of **0.3** to **0.4 mm (0.012 ~ 0.016 in.)**, bring it into this range by bending the lower contact arm. Bending the arm even just a little varies the gap widely; be careful not to over-bend the arm. **(Fig. 9-12)**

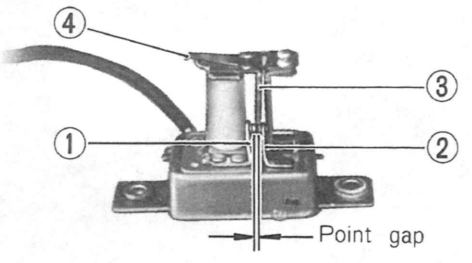


Fig. 9–12 1. Upper contact 2. Lower contact 3. Armature 4. Voltage adjusting arm

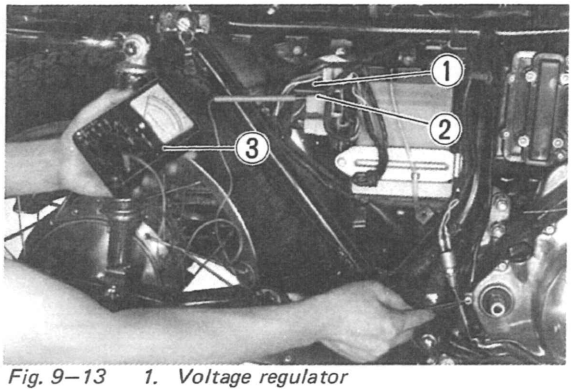


Fig. 9–13 1. *Voltage regulator*
2. *Multi-lead connector*
3. *Tester*

4. **Voltage Setting:**

The level of voltage at which the voltage regulator operates in the manner already described is set by positioning the voltage adjusting arm properly **(Fig. 9-12).** The arm is repositioned by bending it. Bending it upward raises the regulated voltage, and vice versa.

Adjustment of the regulated voltage, that is, setting the voltage regulator is to be carried out under the following conditions:

The alternator is in sound condition, capable of generating voltage.
The charging system is properly wired.
The battery is in fully charged state.
There is no leakage of electricity in the system.
All electrical loads, such as head lamps, stop lamp and the like, are all off.

Under these conditions, check the voltage and adjust the regulator as follows:

(1) Run the engine steady at about 3000 rpm.

(2) Insert one tester pin into the multi-lead connector to touch the O/W lead in there, and put the other pin to the main case. The tester is now connected between ground and the line connecting the alternator to the battery.

(3) Read the voltage indication. The reading should be anywhere between 14.5 and 15.3 volts—the range specified for the operating conditions stated above. If the reading is way off this range, bring it into the range by bending the voltage adjusting arm.

d. Reassembly

Reassemble the voltage regulator by reversing the procedure of disassembly.

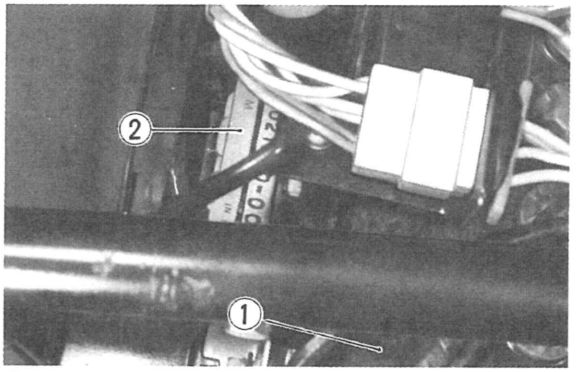


Fig. 9–14 1. *Battery*
2. *Sillicon rectifier*

9-4. RECTIFIER

a. Description

The electromotive force induced in each stator coil of the three, connected to present a three-phase "Y" winding, is an AC voltage. The three voltages, alternating identically and sequentially, apply to the 6-diode rectifier unit, in which the three voltages undergo full-wave rectification to emerge as a DC voltage.

b. Removal

1. Open the seat and remove the nut fastening the rectifier unit to the frame. Bring out the unit. **(Fig. 9-14)**
2. Uncouple the multi-lead connector to electrically disconnect the rectifier unit from the alternator. Disconnect the unit from the battery, and take it out.

c. Inspection

1. Using the tester, check the removed rectifier unit for internal circuit continuity in two directions, forward and reverse. If the unit exhibits continuity even in the reverse direction or no continuity in the forward direction, replace it by a new one. **(Fig. 9-15)**

   Caution: For the tester, never use a megger (insulation resistance meter) or the silicon diodes may become ruptured due to excessively high test voltage.
2. Inspect the seating portion of the case for cleanliness. Dirt or rust, if any, must be removed with sandpaper to ensure a metal-to-metal contact for good grounding.

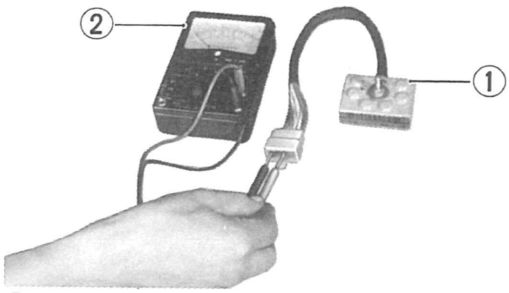


Fig. 9–15 1. Sillicon rectifier 2. Tester

d. Installation

Just carry out the two steps **1,** an **2,** **b. Removal,** in the reverse order to install the rectifier unit.

STARTING SYSTEM

GROUP 10

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10-1. GENERAL DESCRIPTION

DESCRIPTION

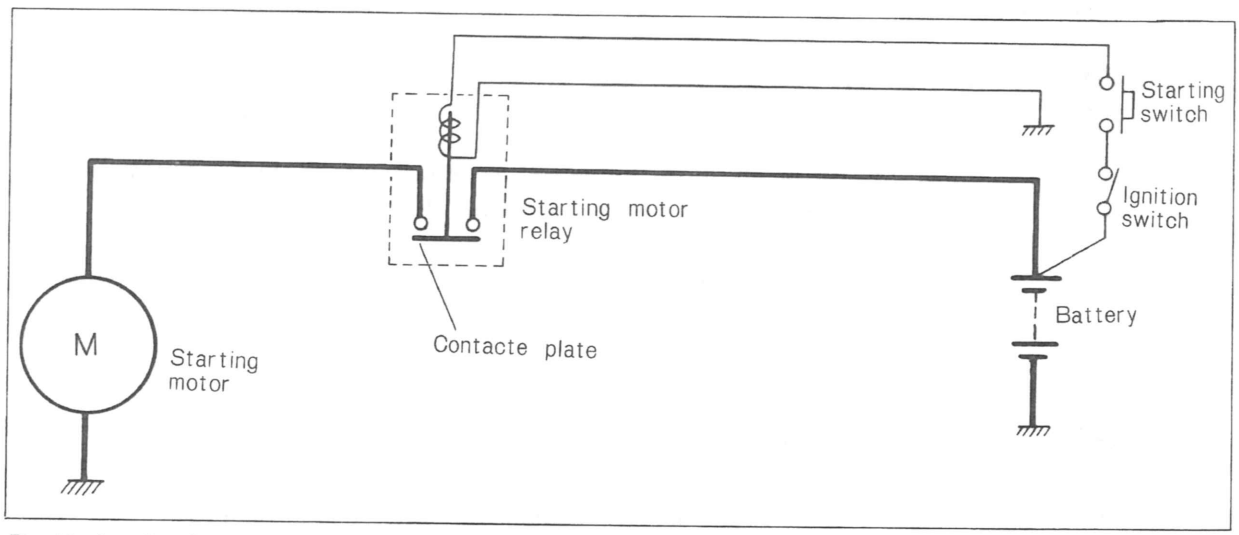

Fig. 10–1 Starting motor circuit

When ignition switch and engine kill switch are both in "ON" position, depressing the starting switch connects the solenoid of the starting motor relay to the battery, so that this solenoid becomes energized and exerts a magnetic pull to the armature or contact plate within the relay. The contact plate thus moves toward the solenoid and closes the contact to complete the starting motor circuit.

With the motor circuit so closed, a starting current of about 120 amperes rushes into the motor and the motor begins to run. Motor output drive is transmitted by starter clutch and primary drive chain to the eccentric shaft to "crank" the engine for starting up.

SPECIFICATIONS

STARTING MOTOR:			
Rated output and voltage	1 k watts and 12 volts		
"Cranking" duration	30 seconds mixmum at a time		
Direction of rotation	Counterclockwise, as viewed from shaft side		
Operating data:	No load	Under load	Under stalling load
VOLTAGE	11.5 V	8.5 V	2.4 V
CURRENT	80A max.	270A max.	400A max.
TORQUE	——	0.3 kg-m min. (2.2 ft-lb)	0.4 kg-m min. (2.4 ft-lb)
REVOLUTION	8000 rpm min.	3000 rpm min.	——
Primary reduction ratio	6.333 (57/19)		
Secondary reduction ratio	4.714 (66/14)		
Tertiary reduction ratio	0.605 (23/38)		
STARTING MOTOR RELAY:			
Rated voltage	12 volts		
Operating voltage	6.5 volts		

Item	Standard value	Service limit
Carbon brush length	14 mm (0.55 in.)	10 mm (0.4 in.)
Mica undercut	——	0.3 mm (0.012 in.)
Spring on carbon brush	1.7 kg (3.7 lb)	1.4 kg (3.1 lb)

TROUBLE-SHOOTING

Symptom	Probable cause	Remedy
Starting motor will not run	1. The battery is in "run down" condition	Recharge or replace
	2. Imperfect contacting action within the starting motor relay	Repair or replace
	3. Brushes are not seating tight in the starting motor	Repair or replace the brushes

10-2. STARTING MOTOR

a. Description

The starting motor is behind the engine unit and is mounted on the transmission case. Drive from this motor is transmitted to eccentric shaft through starting clutch gear and primary drive chain.

b. Disassembly

1. Remove the engine sprocket cover as outlined in **2-2, page 11.**
2. The starting motor is secured by two bolts to the case. Remove these bolts, disconnect the lead wire (which extends from the starting relay) and take off the motor. **(Fig. 10-2)**

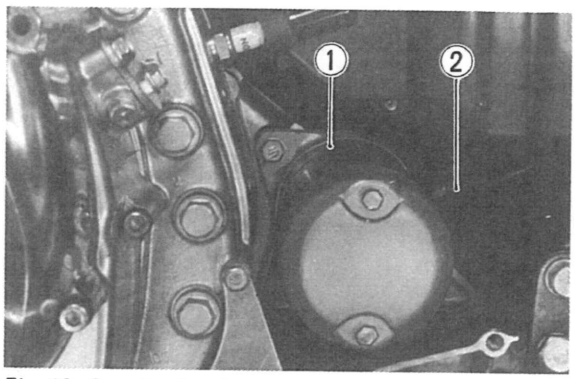

Fig. 10–2 *1. Starting motor*
2. Starting motor lead wire

3. Loosen the two bolts fastening down the starting motor cover, and disassemble the motor into parts illustrated in Fig. 10-3.

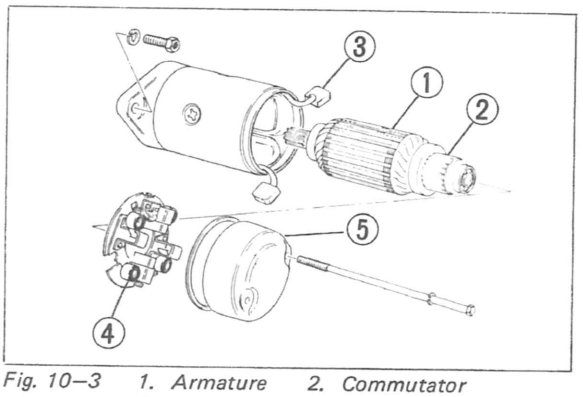

Fig. 10–3 *1. Armature* *2. Commutator*
3. Brush *4. Brush spring*
5. Starting motor cover

c. Inspection

1. Check the carbon brushes for wear by measuring the brush length with a caliper rule, as shown in **Fig. 10-4.** A brush measuring less than **10 mm (0.4 in.)** must be replaced.

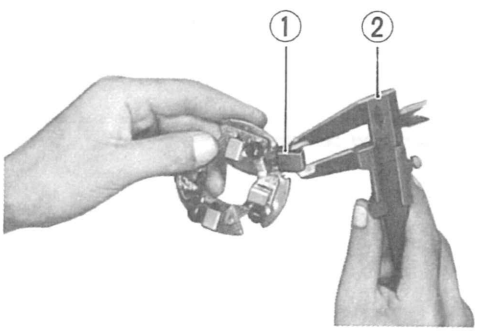

Fig. 10–4 *1. Carbon brush* *2. Caliper rule*

2. Inspect the commutator surface for condition, and check the mica undercut, which is prescribed to be not less than **0.3 mm (0.012 in.).** A gummy or glazed commutator surface can be repaired by grinding with sandpaper; a badly grooved surface may be repaired by turning in a lathe if a sufficient stock is available for cutting. To undercut the mica, go by the standard practice, taking care not to cut off too much mica. **(Fig. 10-5)**

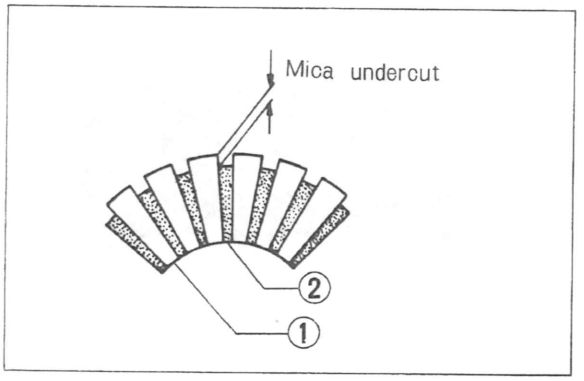

Fig. 10–5 *1. Commutator* *2. Mica*

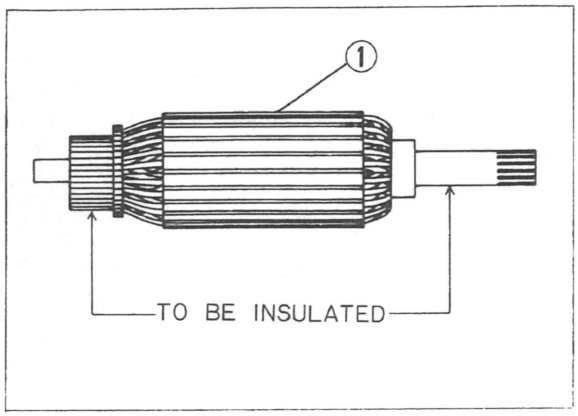

Fig. 10–6 1. Armature

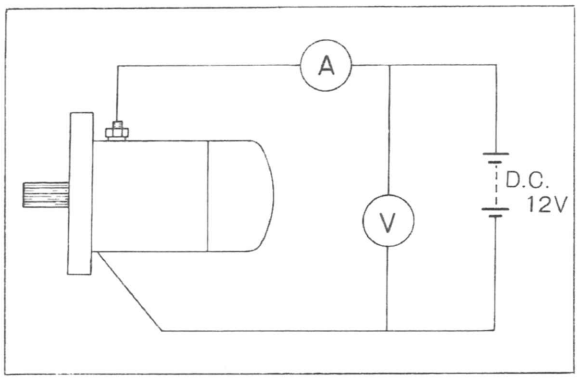

Fig. 10–7 No-load current test

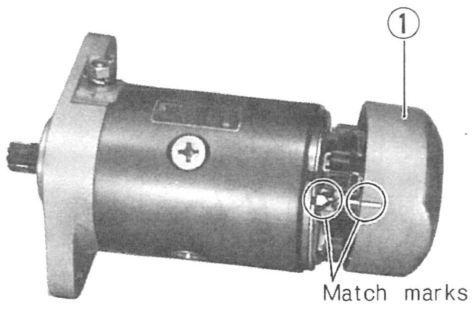

Fig. 10–8 1. Starting motor cover

3. Armature Insulation Test:

This test is for checking to be sure that the insulation between the rotor core (lamination) and the armature coils is in good condition, and can be accomplished with a tester, as shown in **Fig. 10-6.** Put one probe pin to a segment of the commutator and the other pin to the journal. The insulation is in sound condition if the tester does not indicate any evidence of continuity.

4. No-load Current test:

This is another bench test purporting to reveal the electrical condition of the motor and the internal mechanical resistance to the rotation of its rotor. Connect the motor to a fully-charged 12-volt battery, as shown in **Fig. 10-7** and read the ammeter indication when the motor is running. (The motor will pick up speed to a very high level because it is not loaded.) The motor is free from such faults as open or shorted windings if the ammeter indicates **80** amperes or less. A larger current indicated by the ammeter means the possibility of the rotor shaft being bent, of a faulty winding or of the armature rubbing. Improperly seated brushes too could be the cause of a high no-load current.

d. Reassembly

Adhere to the following instructions in reassembling the starting motor:

(a) Be sure to align the match marks when putting the starting motor cover on, as shown in **Fig. 10-8.** One mark is a line engraved on the cover, and the other mark is an arrowhead plate protruding from the brush set plate. Tightening torque for the cover securing bolts is specified to be between **30** and **60 kg-cm (2.2 ~ 4.4 ft-lb).**

(b) Tightening torque for the nut fastening down the lead wire to the motor terminal is specified. After fitting the wire end to the terminal, torque the nut to anywhere between **40** and **70 kg-cm (2.9 ~ 5.1 ft-lb).**

(c) The torque specification for the bolts securing the motor to the main case is **130** to **230 kg-cm (9.5 ~ 17 ft-lb).**

(d) The torque specification for the Allen-head bolts securing the engine sprocket cover is **80** to **90 kg-cm (6.0 ~ 6.6 ft-lb).**

10-3. STARTING RELAY

a. Description

The starting relay is a remotely controlled switch having a high current capacity. The reason of using this relay is explained by the fact that the starting motor draws a very large inrush current exceeding a hundred and some tens of amperes. This much current could burn an ordinary lead wire.

The starting relay is located between battery and starting motor and connected in a line having a large conducting capacity. It contains a solenoid (electromagnet coil and plunger), which is turned on and off by means of the starting switch. The plunger carries movable contact points. Turning on the starting switch energizes the solenoid to close the contact, thereby completing the high-current circuit to the starting motor. **(Fig. 10-9)**

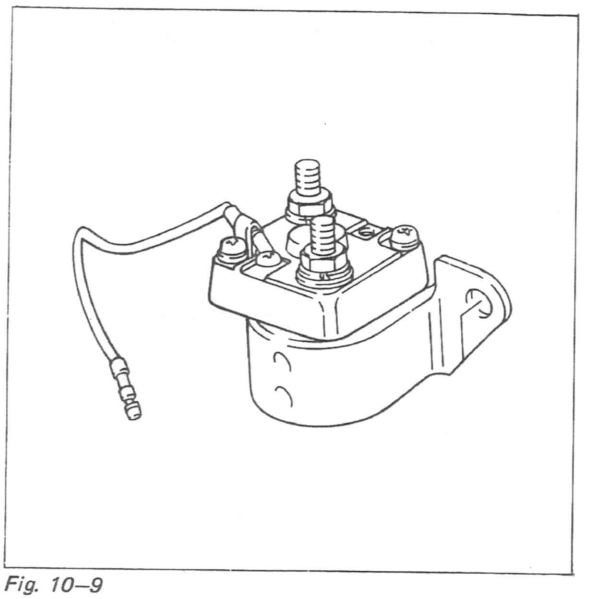

Fig. 10–9

b. Removal

1. Open the seat and disconnect two high-current wires from the starting relay; one wire is from the battery and the other from the starting motor. Disconnect the lead wire extending from the starting switch. **(Fig. 10-10)**
2. Remove the two bolts securing the relay to the battery holder, and take out the relay.

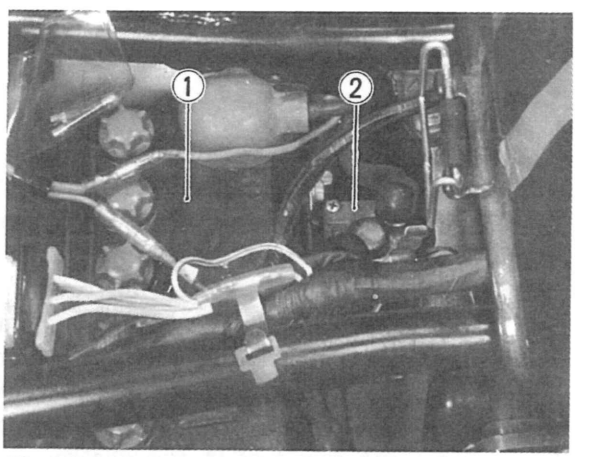

Fig. 10–10 1. Battery 2. Starting relay

c. Inspection

1. Before removing the starting relay, test it by depressing the starting switch to see if the relay issues forth a clicking sound just when the switch is pressed down. If it does, it means that the solenoid plunger is working properly.
2. Inspect the contact points of the relay with great care, particularly where the relay has long been in service. Because of very high starting current the relay handles, its contact points could be in pitted, roughened or burnt condition to present a large resistance. Such contact points can be reconditioned by filing or grinding the point faces with a file or sandpaper. Pitted or burnt contact points could reduce the inrush current drawn by the motor to result in poor "cranking" performance.

d. Installation

Reassembly is the reverse of disassembly.

10-4. STARTING CLUTCH AND REDUCTION GEAR

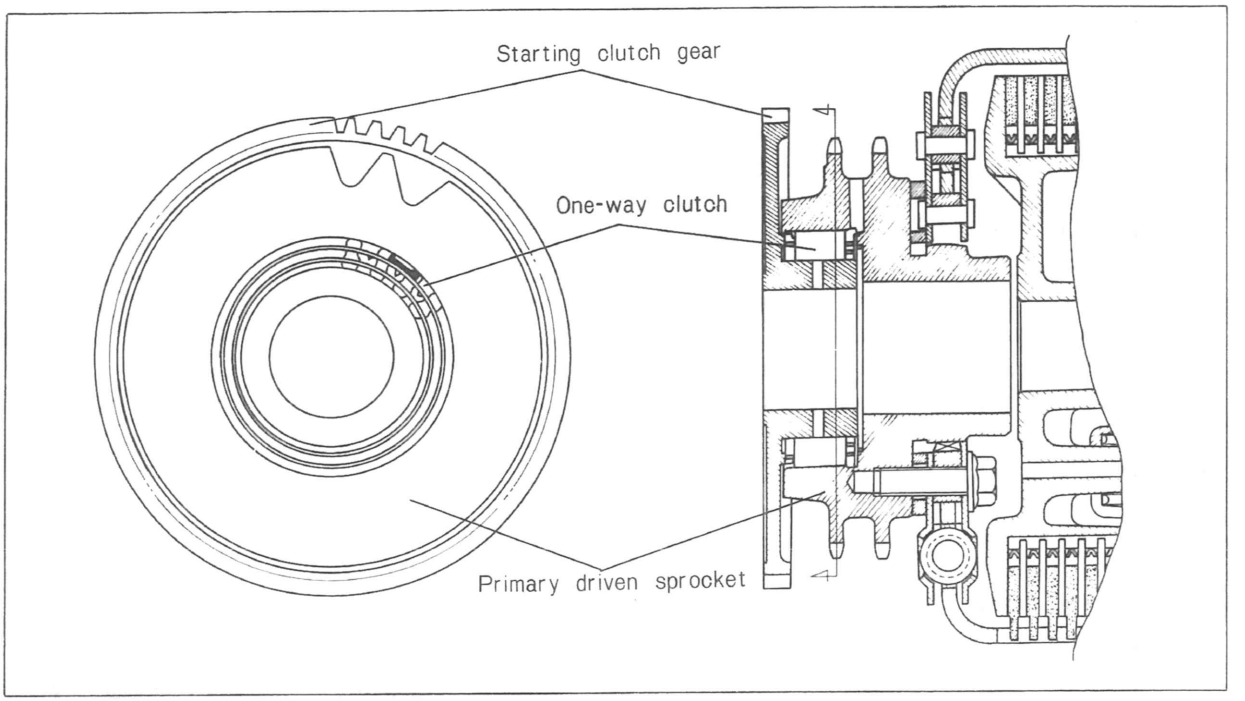

Fig. 10–11

a. Description

A one-way clutch is located between the embossed hub of starting clutch gear and the bore of primary driven sprocket, as shown in **Fig. 10-11.** "Starting clutch" refers to this arrangement.

When the starting motor is running, driving the starting clutch gear, the sprags **(Fig. 10-12)** stand up and wedge into between sprocket and gear, so that the primary driven sprocket becomes locked to the starting clutch gear. Thereafter, the two run together to transmit "cranking" drive to the clutch. In **Fig. 10-12,** the sprags in free-wheeling condition are represented by the dot-line profile. The solid-line profile stands for a sprag in wedged-in condition.

As the engine fires and picks up speed, the primary driven sprocket begins to run faster than the starting clutch gear. When this occurs, the sprags cock a little and get out of wedged-in position, so that the starting clutch gear runs in free-wheeling condition.

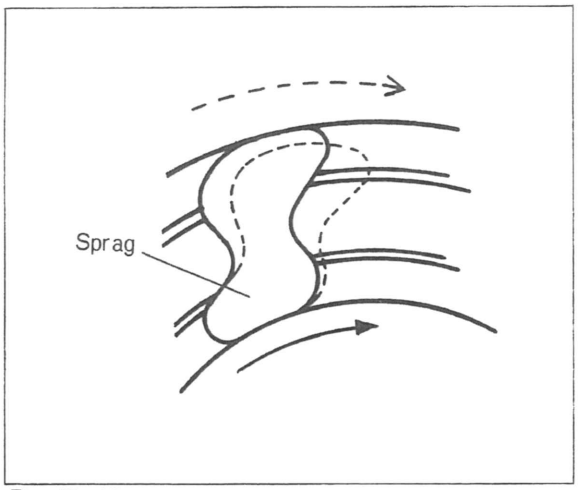

Fig. 10–12

b. Disassembly

1. Carry out the removal and disassembling procedure, as outlined in **2-2, pages 9** to **11** and **13** to **15,** to expose the starting clutch gear ready for disassembly.
2. Remove the starter clutch gear and one-way clutch by pulling them off the clutch housing. See **Fig. 10-13.**
3. Using the **snap ring opener (Tool No. 09920-70111),** remove the circlip retaining the starter reduction gears, and draw out the gears, as shown in **Fig. 10-14.**

c. Inspection

1. Inspect the starting clutch components for evidence of cracking. Components found or suspected to be cracked condition must be replaced.
2. With the one-way clutch and starting clutch gear fitted to the clutch housing, test the one-way clutch for smoothness of rotation by spinning it by hand. Make sure that, when the gear is turned clockwise by one hand while holding the clutch housing by the other, the clutch engages positively to lock the gear to the clutch housing. Also, check to be sure that the clutch free-wheels smoothly when the gears is turned counterclockwise.
3. Visually inspect the needle bearing and also the teeth of the starter reduction gear for wear.

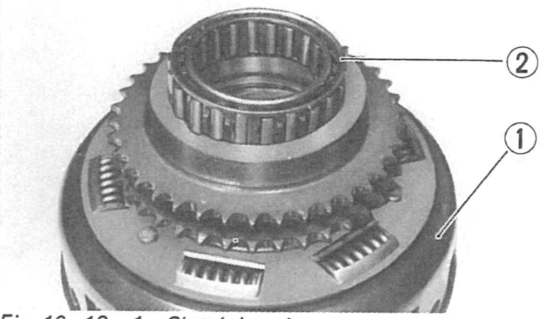

Fig. 10–13 1. Clutch housing
2. One-way clutch

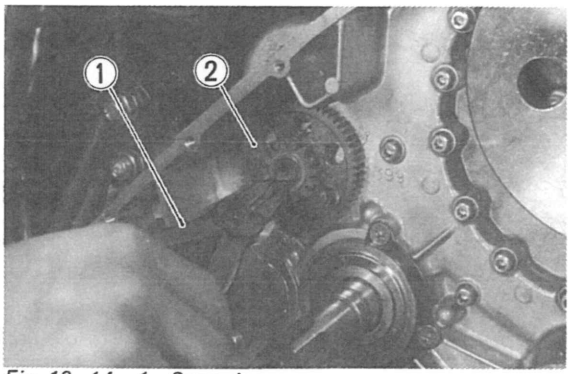

Fig. 10–14 1. Snap ring opener
2. Reduction gear

d. Reassembly

Reversing the disassembling procedure restores the starting clutch and reduction gear to their original positions, but there is one step which must be executed with care. The step is that of fitting the one-way clutch to the clutch housing.

The peripheral edge of one end of the one-way clutch is flanged while the edge of the other end is not. When fitting the clutch into the clutch housing, hold the clutch with the flanged end facing you and insert it with the non-flanged end foremost. **(Fig. 10-15)**

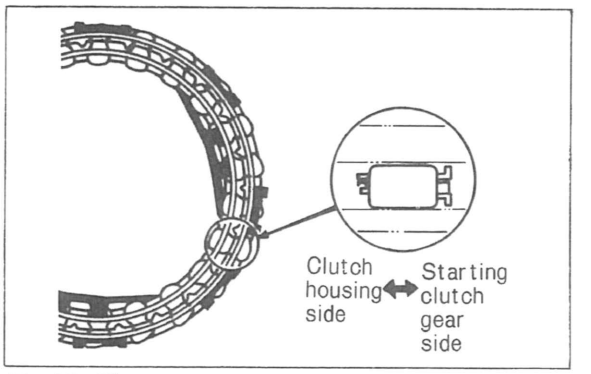

Fig. 10–15

BATTERY

GROUP 11

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11-1. GENERAL DESCRIPTION

DESCRIPTION

A vacuum-sealed dry battery of YUASA make, Type Y60-N24L-A, is furnished with the RE5. This battery, when properly activated and initially charged, has a capacity of 30 ampere-hours on 20-hour rating basis. No skill is required in activating this battery and charging it for the first time to place it in initial service; all necessary information is contained in the instructions given under the heading of INITIAL CHARGING METHOD. Battery service life depends much on the attention it receives thereafter. Each RE5 user should be reminded of the importance of the care needed by the battery in service.

SPECIFICATIONS

Type designation	YUASA Y60-N24L-A
Battery voltage	12 volts
Standard electrolyte S.G.	1.26 (at 20°C or 68°F)

TROUBLE-SHOOTING

Symptom	Probable cause	Remedy
"Sulfation" evidenced by whitish overlays or spots on surfaces of cell plates	1. Not enough electrolyte	Add distilled water or depending on the cause of low level, and recharge, if "sulfation" is not advanced far
	2. Battery container is broken	Replace the battery
	3. Battery has been left long in run-down condition	Replace the battery
	4. Adulterated electrolyte (Some foreign matters have entered the electrolyte to contaminate it.)	If "sulfation" is not advanced too far, try to revive the battery by replacing the electrolyte, recharging it to fully charged state off the machine and then adjusting electrolyte S.G.
The battery runs down easily	1. The charging system is not set for proper charging operation	Check the alternator, regulator and circuit connections, and make necessary adjustments for specified charging operation
	2. Cell plates have lost much of their active material as a result of overcharging	Replace the battery, and correct the charging system
	3. Short-circuit condition exists within the battery due to excessive accumulation of sediments caused by high S.G. of the electrolyte	Replace the battery
	4. Electrolyte S.G. too low	Bring the battery to fully charged state by recharging and adjust electrolyte S.G.
	5. Adulterated electrolyte	Replace the electrolyte, recharge the battery and then adjust S.G.
	6. Battery life has ended	Replace the battery
Reversed battery polarity.	The battery is connected the other way around in the system, so that it is being charged in reverse direction.	Replace the battery and be sure to connect the replacement battery correctly in the system

INITIAL CHANGING METHOD

Each new RE5 motorcycle is delivered with its battery in **"vacuum-sealed dry"** condition. This battery is to be prepared into operable condition according to the following four-step method:

1. Initial electrolyte filling

Take down the battery from the machine, and set it up on the battery servicing bench. Fill up each cell to upper level with the electrolyte, which is –

Dilute sulfuric acid solution with acid concentration of **34.6%** by weight, having a specific gravity of **1.26** at **20°C (68°F)**, whose temperature, at the time of filling, is not higher than **30°C (86°F).**

After filling up, let the battery stand for about **30 minutes.** Then, check elecrolyte level in each cell and, if the electrolyte surface is down, add the same electrolyte. Make sure the electrolyte is up to upper level uniformly in all the cells.

2. Initial charging duration

The active materials on the cell plates have a store of energy equivalent to 75% of the rated capacity, if the battery is one that has just been manufactured and supplied by the battery maker. This stored energy, however, dissipates spontaneously and progressively with lapse of time, so that, after filling it with the electrolyte, the charging duration must be extended if a period longer than 6 months has elapsed since the date of manufacture (which is indicated on each battery as shown in **Fig. 11-1),** the standard initial charging duration being 20 hours. The extension is to be determined according to this schedule:

Age of dry battery (since manufacture)	up to 6 months	Over 6 months & up to 9 months	Over 9 months & up to 12 months	Over 12 months
Initial charging duration	20 hours	30 hours	40 hours	60 hours

Date of manufacture is indicated by a three-part number, **Fig. 11-1,** the leftmost part standing for the calendar date, the middle part the month, and the last part the year.

3. Initial charging current

The constant-current method of charging is recommended for initial charging, and is assumed in the following procedure:

(1) Before turning on the charger, to which the filled battery is connected, remove the seal cap and cell caps. Be sure that the polarity marks are matched correctly in charging line connections. **(Fig. 11-2)**

(2) Start charging, with the charger set for a charging rate of 3 amperes. While charging is progress, check the electrolyte for S.G. (specific gravity) and also the charging voltage now and then, particularly toward the end of the charging duration.

(3) Toward the end of the duration, the battery will start gassing and the voltage and S.G. will be up and leveling; if not, it is likely that the vacuum seal failed during transit or in storage. Continue charging, even in excess of the predetermined duration, until the voltage and S.G. have leveled for one or two hours, with the battery allowed to stay in gassing condition.

Fig. 11–1 1. Manufacturing date

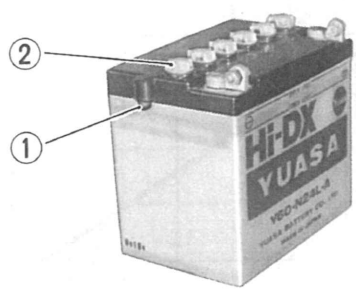

Fig. 11–2 1. Seal cap 2. Battery cell cap

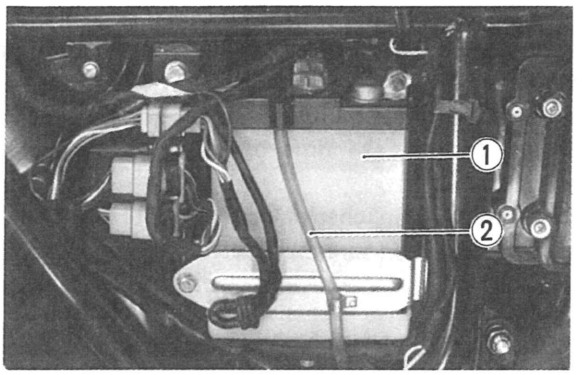

Fig. 11–3 *1. Battery*
2. Battery vent hose

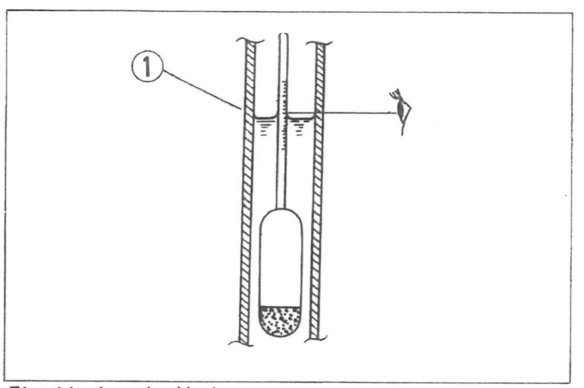

Fig. 11–4 *1. Hydorometer*

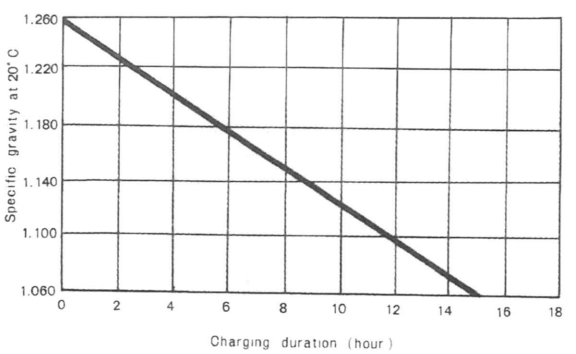

Fig. 11–5

4. Electrolyte adjustment

Upon terminating the charging operation, recheck electrolyte S.G. to make sure it is 1.260 as corrected to 20°C (68°F). Add distilled water, as necessary, to adjust the S.G. upper level in each cell, as necessary. Restore the caps, and wash the surfaces of the battery container with fresh water. Let the washed surfaces dry up before mounting the charged battery on the machine.

11-2. BATTERY SERVICING

a. Removal

1. Open the seat, and disconnect the wire from the positive terminal of the battery.
2. Remove the right-side frame cover. Pull off the battery vent hose. Disconnect the wire from the negative terminal of the battery. **(Fig. 11-3)**
3. Remove the bolt securing the battery plate, take off the plate, and remove the battery.

b. Inspection

1. Visually inspect the surfaces of the battery container. If any sign of cracking or electrolyte leakage through the wall of the container is noted, replace the battery.
2. Check the terminal posts with sandpaper to remove rust, if any. Rust or white powdery coating is lead sulfide; it can be washed off with hot water.
3. Cleck the electrolyte level and add distilled water, as necessary, to raise the electrolyte surface to upper level in each cell.
4. Check the battery for state of charge by taking an electrolyte S.G. reading. If the reading is **1.200** or **less,** as corrected to 20°C (68°F), it means that the battery is in run-down condition and needs recharging.

Recharging operation based on S.G. reading

To correct a S.G. reading to 20°C (68°F), use this formula:

$$S_{20} = S_t + 0.0007\ (t - 20),$$

Where S_{20} = corrected value of S.G. (20°C or 68°F),

S_t = value of S.G. read at temperature t°C,

0.0007 = temperature coefficient of S.G., and

t = temperature in degrees Centigrade, at which S_t was read.

To read the S.G. on the hydrometer, bring the electrolyte surface in the hydrometer to the eye level and read the graduation on the float scale bordering on the meniscus (curved-up portion of electrolyte surface), as shown in **Fig. 11-4.**

Refer the reading (as corrected to 20°C) to the graph of **Fig. 11-5** to determine the duration in hours of recharging operation by **constant-current charging** at a charging rate of **3 amperes** (which is a tenth of the capacity of the present battery).

Be careful not to permit the electrolyte temperature to exceed **45°C (113°F)** at any time during the recharging operation. Interrupt the operation, as necessary, to let the electrolyte cool off.

The battery may be deemed to have been properly recharged if any three of the following four conditions are met:

Recharging has been continuted for so many hours as was originally determined by referring to the graph of **Fig. 11-5.**

Electrolyte S.G. rose to **1.260** or higher and has remained there for at least one hour.

Battery terminal voltage rose to **15 volts** or higher and has remained there for at least one hour.

Profuse **"gassing"** has occurred in each cell.

Note: Constant-voltage charging, otherwise called "quick" charging, is not recommendable for it nibbles at the life of the battery. "Quick" charging should be regarded as a last resort in a case of emergency and, if used as such, must be carried out with the following precautions:

Limit the charging current to 30 amperes.

Limit the temperature of electrolyte to 55°C (132°F).

Recharge off the machine. Never attempt to "quick" charge the battery in place.

Exercise all common-sense precautions on battery charging.

Operate the charger in a manner consistent with the directions prescribed for the charger.

c. Installation

Before mounting the battery, make sure that the exterior surfaces of the battery container are dry and clean of electrolyte. Be careful not to leave out the vent hose. The installing procedure is the reverse of the removal procedure.

STEERING & SUSPENSIONS

GROUP 12

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12-1. GENERAL DESCRIPTION

DESCRIPTION

The steering and suspension designs of this motorcycle incorporate many details specially worked out for comfortable riding in long-distance cruising trips and for keeping up the high cruising ability of the RE5 even on rough roads.

SPECIFICATIONS

Steering handle type	Up-handle type
Steering width	870 mm (34.3 in.)
Steering angle	40° to each side, right and left
Front suspension	Telescopic fork type
Front fork oil and oil capacity	SAE 10W-30, or A.T.F. (automatic transmission fluid); 150 cc (5.3/5.1 US/Imp. oz)
Front fork travel	133 mm (5.24 in.)
Rear suspension	Swing arm type
Rear suspension travel	75 mm (2.95 in.)

Item	Standard value	Service limit
FRONT FORK SPRING		
Free length (L)	504.4 mm (19.858 in.)	479.2 mm (18.865 in.)
(S)	44.5 mm (1.752 in.)	42.2 mm (1.661 in.)
Spring outer dia. (L)	25.5 mm (1.004 in.)	———
(S)	25.5 mm (1.004 in.)	———
Coil diameter (L)	4.8 mm (0.1890 in.)	———
(S)	3.0 mm (0.1181 in.)	———
Preload	11.2 kg (26.6 lb)	———
Front fork inner tube outer diameter	34.925～34.950 mm (1.3750～1.3760 in.)	34.90 mm (1.374 in.)
Front fork outer tube inner diameter	35.025～35.065 mm (1.3789～1.3805 in.)	35.21 mm (1.386 in.)

TROUBLE-SHOOTING

Sympton	Probable cause	Remedy
Steering handle "feels" heavy	1. Steering stem nut too tight 2. Thrust-bearing balls are dented, rusted or otherwise damaged 3. Distorted steering stem	Loosen Replace Replace
Wheel is wobbly	1. Steering stem nut is too loose	Retighten
Soft suspension	1. Loss of spring tension	Replace
Hard suspension	1. Poor damping action in front forks 2. Poor damping action of rear shock absorber	Repair or replace Replace
Suspension noise	1. Loose joints and connections 2. Fork spring is interfering with fork inner tube 3. Not enough or deteriorated fork oil 4. Deteriorated oil in rear shock absorber	Retighten Repair or replace Replenish or replace Replace

12-2. STEERING

a. Description

The steering system is composed of these members: handle bar, steering stem head and steering stem, to mention but the major ones. The handle bar is mounted on the steering stem head and secured to the head by two handle bar clamps.

The stem head is mounted on the front forks. It is secured to the forks by two bolts and to the steering stem by the steering stem bolt, as shown in **Fig. 12-1.**

The steering stem extends through and is held by the frame head pipe; it is retained by the steering stem nut, and is capable of smooth rotary motion because of two ball thrust bearings, one at the top end and the other at the bottom end of the frame head pipe.

The angular range of steering movement is limited by the stopper plates welded to the frame head pipe and by the embossed parts of the steering stem.

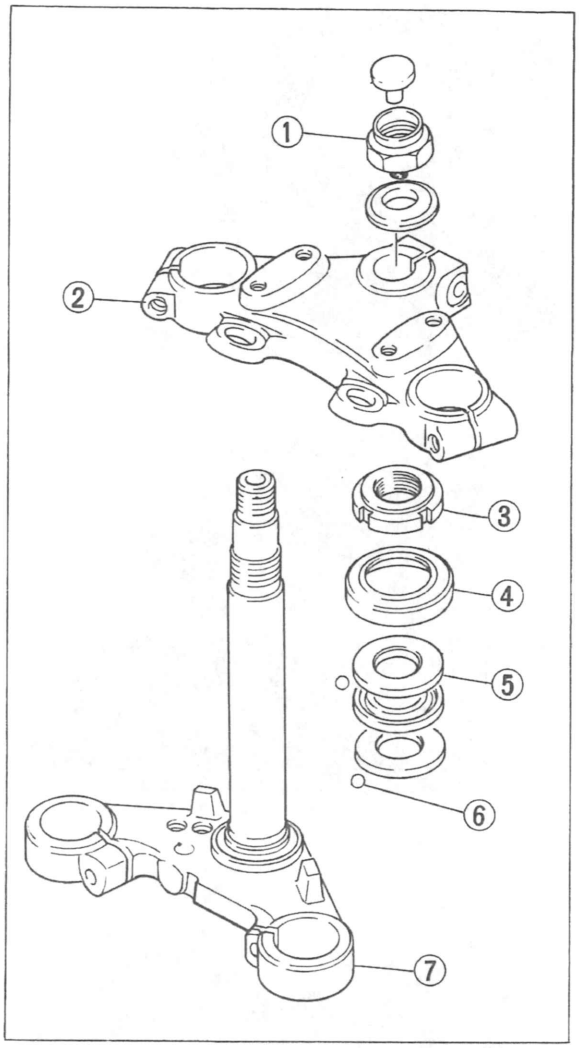

Fig. 12–1 1. Steering stem bolt 2. Steering stem head 3. Steering stem nut 4. Dust cover 5. Cone race 6. Steel ball 7. Steering stem

b. Disassembly

1. Remove the brake master cylinder and the 3-way joint. Mounting bolts must be removed, respectively. See **Figs. 12-2** and **12-3.**
2. Disconnect the clutch cable from the clutch lever.
3. Loosen the two handle switch screws on the right-hand part of the handle bar, and disconnect the throttle cables (pulling and returning cables) from the grip.

Fig. 12–2 1. Master cylinder

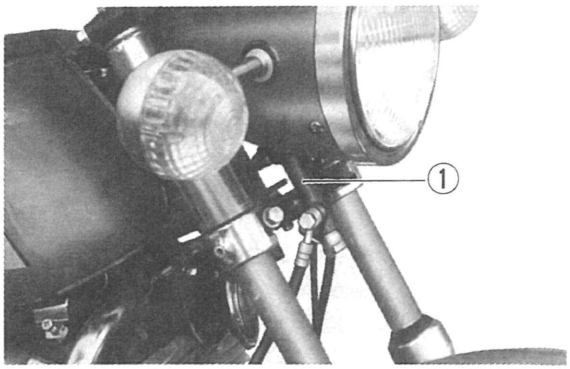

Fig. 12–3 1. Three-way joint

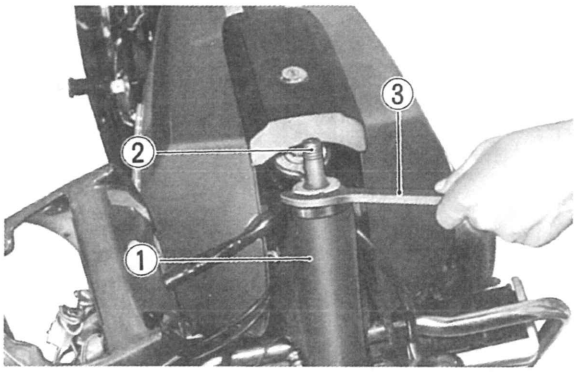

Fig. 12–4 1. From head pipe 2. Steering stem 3. Steering stem nut wrench

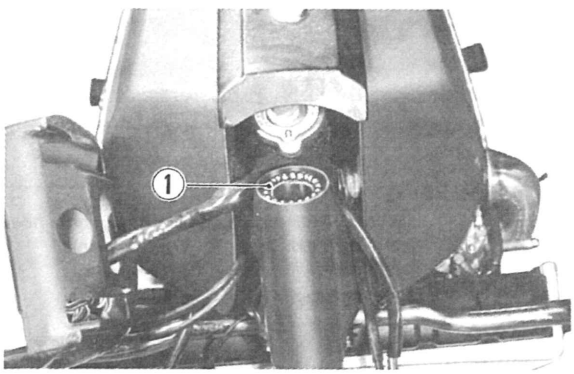

Fig. 12–5 1. Steel ball

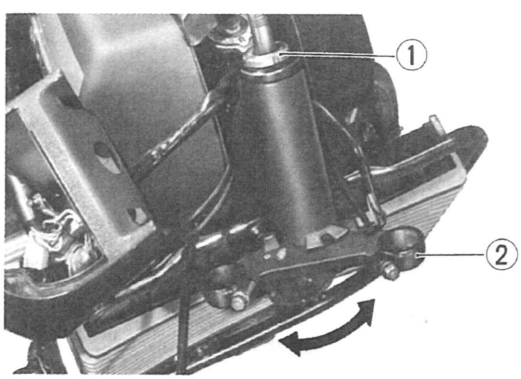

Fig. 12–6 1. Steering stem nut 2. Steering stem

4. Remove the 4 clamps staying the electrical wires extending to the two switches, right and left, on the handle. Remove the screws securing the left-side switch to the handle, and take off the switch.
5. Undo the two handle bar clamps, and remove the bar.
6. From the steering stem head, remove the speedometer/tachometer assembly together with the ignition switch case.
7. As outlined in **13-2 (b),** remove the front wheel and front forks.
8. Loosen steering stem head bolt and rear nut, and remove the stem head.
9. Using the **steering stem nut wrench (Tool No. 09940-10122),** loosen the nut, and draw the steering stem out of the frame head pipe, as shown in **Fig. 12-4.** Be careful not to let the steel balls fall off the two thrust bearings when the stem is coming out of the head pipe.

c. Inspection

1. Inspect the steering stem and stem head for evidence of cracks. Examine the welds on the steering stem with greater care.
2. Inspect the steel balls for abnormal wear such as flats and grooves, and check to be sure the inner and outer races are in good condition, free from any "brinelling" or dents.
3. Examine the races formed of the frame head pipe for abnormal wear.

d. Reassembly

1. Reassembly is the reverse of disassembly as far as the sequence is concerned, and must be carried out by adhering to the following instructions:

   Apply the fiber grease liberally to the steel ball races at the top and bottom ends of frame head pipe before installing the stem. Remember, each thrust bearing takes 18 steel balls. **(Fig. 12-5)**
2. The steering stem is to be installed in the following sequence: Gently insert the stem into frame head pipe, taking care not to cause the steel balls to spill out, put on the dust seal, and run down the stem nut gradually while turning the steering stem back and forth, as indicated in **Fig. 12-6.** Tighten the nut until the stem begins to offer some resistance to the

back-and-forth turning.

3. Be sure to go by the procedure outlined in **12-3(d)** to install the front forks.
4. Install the steering stem head.
5. Mount the speedometer/tachometer assembly on steering stem head.
6. Secure the handle bar to steering stem head. Be sure to position the bar as guided by the punch mark (on the bar), which should come to the top face of the handle locating saddle, as shown in **Fig. 12-7.**

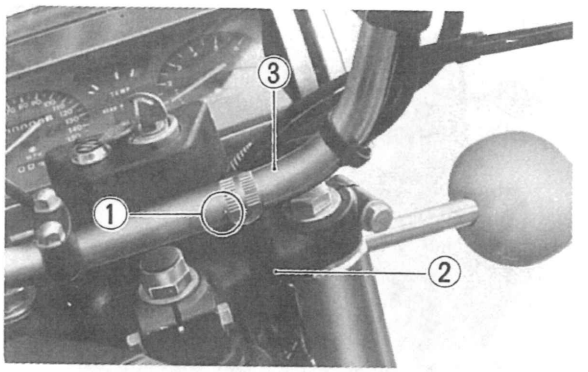

Fig. 12–7 *1. Punch mark 2. Steering stem head 3. Handlebar*

7. Tie the throttle cables to the grip, discriminating the two cables correctly. The cable with a printed letter "R" (for return-side) connects to the lower part of the handle switch, where the letter "R" is cast out. See **Fig. 12-8.**
8. Tie the clutch cable to the clutch lever. Put on the master cylinder, securing it to the handle bar.

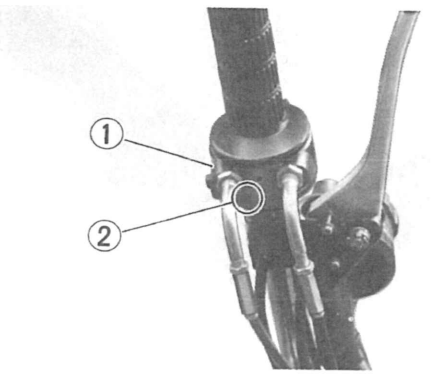

Fig. 12–8 *1. Right-side Handle switch box 2. Identification letter "R"*

12-3. FRONT SUSPENSION

a. Description

Hydraulically-damped telescopic forks are used. Each damper assembly consists of a stainless-steel inner tube, an aluminum outer tube and two coil springs, long and short. The bottom end of the inner tube is fitted with a valve, which opens and closes in response to the vertical movement of the inner tube. When the forks are compressed, the valve moves upward to open the path of oil; when the forks are expanded, the valve moves downward to close the path. By this valve action, the damping force is varied for the two kinds of fork movement—compression and expansion.

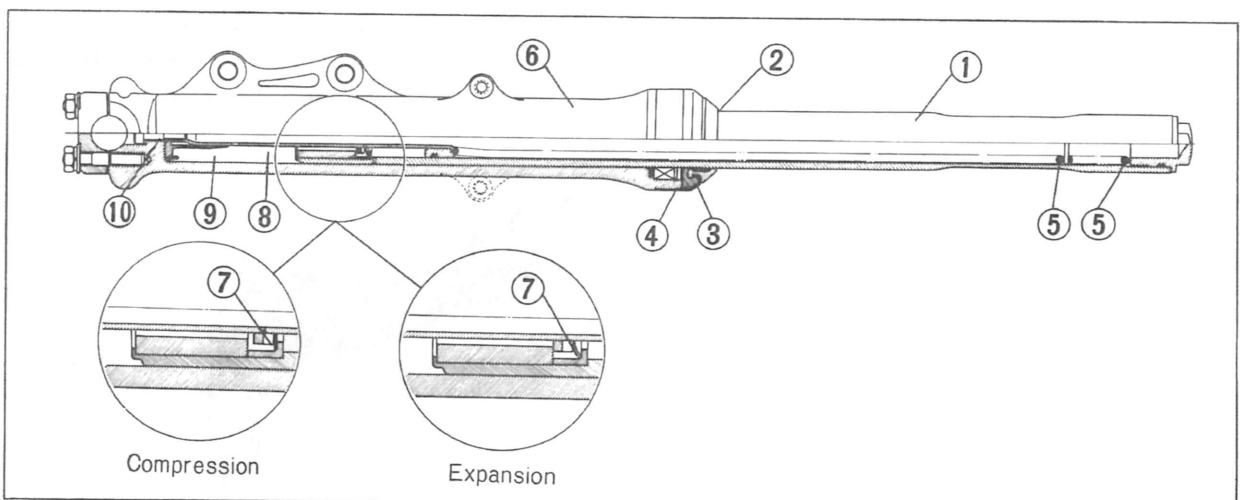

Fig. 12–9 *1. Front fork inner tube 2. Dust cover 3. Circlip 4. Oil seal 5. Coil spring 6. Front fork outer tube 7. Sliding valve 8. Under seat 9. Bottom seat 10. Allen-head bolt*

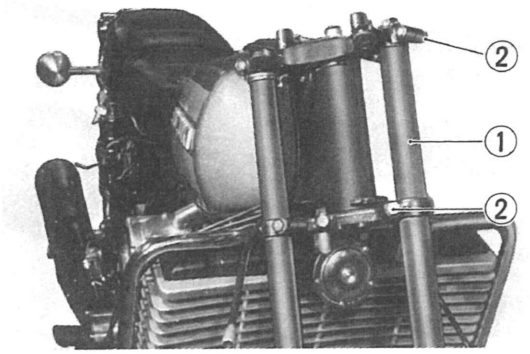

Fig. 12–10 1. Front fork
2. Front fork mounting bolt

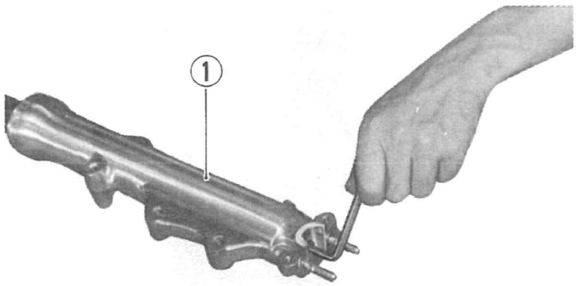

Fig. 12–11 1. Front fork outer tube

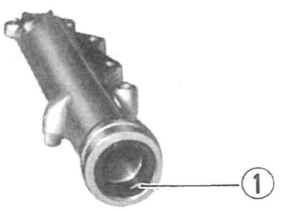

Fig. 12–12 1. Oil seal

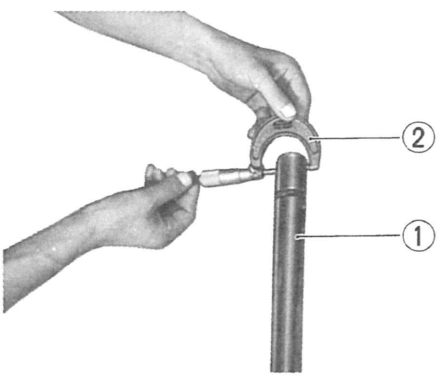

Fig. 12–13 1. Front fork inner tube
2. Micrometer

b. Disassembly

1 Remove the front wheel. The procedure is set forth in **13-2, page 119.**

2. Loosen the bolts securing the calipers, and detach them from the forks.

3. Remove the front fender. Removing four bolts permits the fender to come off.

4. Loosen the four bolts securing the forks to the steering stem head and remove the forks, as shown in **Fig. 12-10.**

5. Loosen the 8-mm Allen-head bolt (which is located at the bottom end of outer tube) securing the under seat, and draw out the inner tube as shown in **Fig. 12-11.**

6. Loosen the fork oil filler cap on the top end of inner tube, and extract the springs from the tube.

7. Using a plain screwdriver, remove the dust cover complete with dust seal from the outer tube.

8. Remove the oil seal circlip from the outer tube with a small plain head screw driver, and take off the oil seal.

c. Inspection

1. Inspect the front fork assemblies in place as follows: Apply the front brake; pump the forks up and down vigorously to observe the smoothness of the cushioning action; and, after this "pumping," inspect the oil seals for sign of oil leakage.

2. Mike the inner tube OD at its bottom end. If the reading is less than **34.90 mm (1.374 in.)**, replace the inner tube (**Fig. 12-13**).

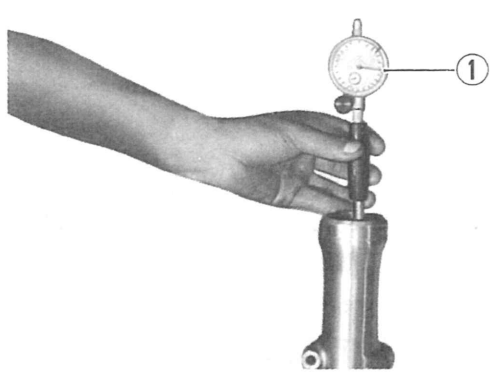

Fig. 12–14 1. Cylinder gauge
2. Front fork outer tube

3. Using a cylinder gauge, check the outer tube ID at a point about **250 mm (10 in.)** from its top end. Replace the tube if a reading greater than **35.21 mm (1.386 in.)** is obtained. **(Fig. 12-14)**

4. Check each inner tube for deflection by rolling the tube on "V" blocks as shown in **Fig. 12-15.** If the deflection read on the dial gauge located at the middle point of the tube is not less than **0.5 mm (0.020 in.)**, repair or replace the tube.

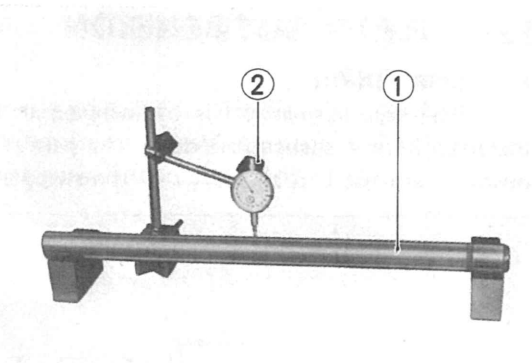

Fig. 12–15 1. Inner tube 2. Dial gauge

d. Reassembly

1. Wash all disassembled parts clean and dry them with compressed air. Fit the under seat, springs, spring joint plate and filler plug into the inner tube, making sure that the long spring goes in with its small-diameter end foremost. See **Fig. 12-16.**

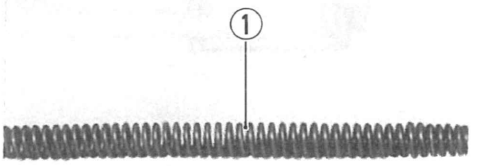

Fig. 12–16 1. Coil spring

2. Insert the bottom seat into the outer tube; then follow this seat with the inner tube tentatively assembled in step **1.** above. Apply the thread lock cement to the thread portion of the Allen-head bolt, run in this bolt and tighten it to a torque between **150** and **250 kg-cm (11 ~ 18 ft-lb).**

3. Using the tool (**Tool No. 09940-53110**) for installing the front fork oil seal, fit the oil seal to the outer tube. (**Fig. 12-17**) Exercise care to see to it that the oil seal will not suffer damage when it is being installed as above. Then, put in the circlip and put on the dust cover.

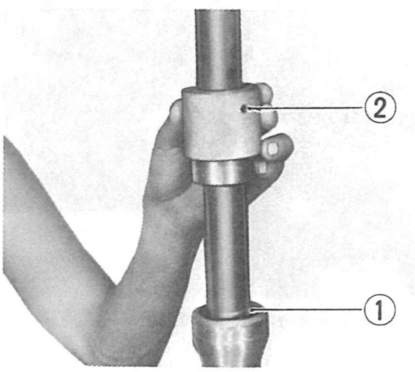

Fig. 12–17 1. Oil seal
2. Oil seal installing tool

4. Attach the front forks to the steering stem and head. Make sure that each inner tube in place has its top end face flush with the top face of the stem head, as shown in **Fig. 12-18.**

5. Secure the front forks by tightening their securing bolts to anywhere between **250** and **400 kg-cm (18 ~ 29 ft-lb).**

6. Install the front wheel and calipers by reversing the removal procedures, that is, as outlined in **13-2 (d), page 121.**

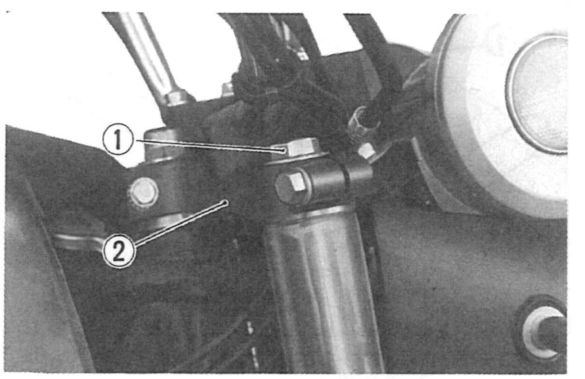

Fig. 12–18 1. Front fork oil filler plug
2. Steering stem head

12-4. REAR SUSPENSION

a. Description

The rear suspension is of swinging arm type with a stroke of 75 mm (2.95 in.). Provisions are included in the suspension design to permit spring preload adjustment in five steps. Oil-impregnated bushings are used in the pivot of the swing arm. The pivot requires no periodical lubricating attention.

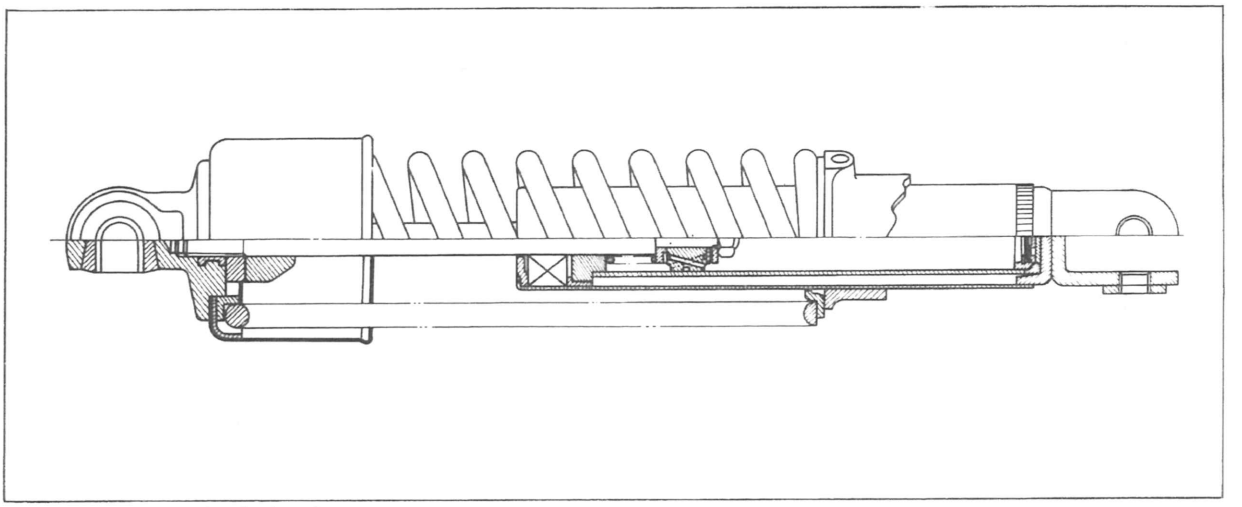

Fig. 12–19 Rear shock absorber

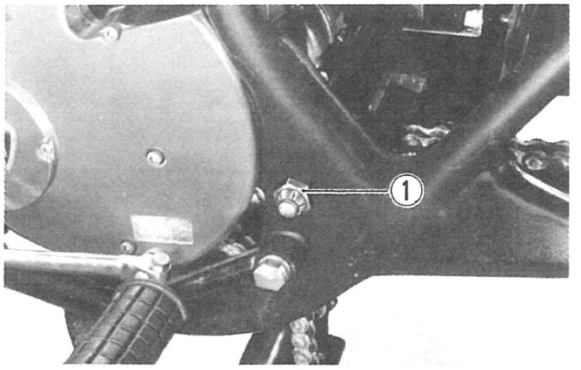

Fig. 12–20 1. Swing arm pivot shaft nut

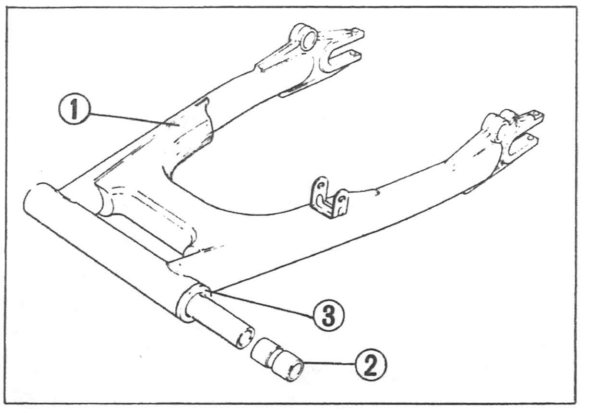

Fig. 12–21 1. Swing arm 2. Spacer 3. Bushing

b. Disassembly

1. Remove the rear wheel as outlined in **13-3, page 123.**
2. Remove the nut and bolt at the top and the bottom end of each shock absorber, and disconnect the ends from the frame and swing arm.
3. Remove the chain case, and loosen the nut at the end of the swing arm pivot shaft. **(Fig. 12-20)**
4. Remove the swing arm, separating the pivoting parts as shown in **Fig. 12-21.**

c. Inspection

1. Through the coil turns of the spring, look into the shock absorber to see if there is any oil visible on the rod. A rear shock absorber found with oil wetting the rod must be replaced.
2. Visually check the swing arm for distortion. An excessively bent or distorted swing arm must be replaced.
3. Mike the spacer OD. Replace the spacer whose diameter is less than **21.90mm(0.862 in.).**
4. Check the bore diameter of the bushing with an inside dial gauge, as shown in **Fig. 12-22.** If the reading is greater than **22.15 mm (0.872 in.)**, replace the bushing.

d. Reassembly

1. Grease the spacer liberally and assemble the pivot section of the swing arm to make the arm ready for connection to the frame.
2. Make the pivot connection between frame and swing arm, and secure the connection by tightening the nut to **500** to **750 kg-cm (36 ~ 54 ft-lb).**
3. Install the rear shock absorbers and tighten the nuts to **200** to **300 kg-cm (14 ~ 18 ft-lb).**
4. Install the rear wheel.

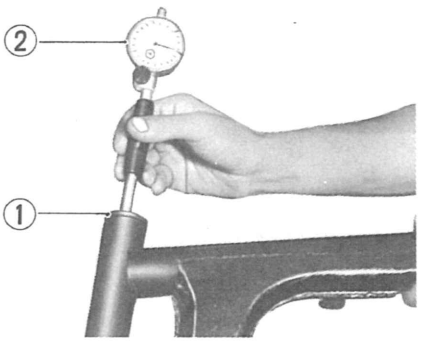

Fig. 12–22 1. Bushing 2. Inner dial gauge

WHEELS, TIRES & FINAL DRIVE

GROUP 13

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13-1. GENERAL DESCRIPTION
SPECIFICATIONS

Wheel rim:	Front	1.85B x 19
	Rear	2.15B x 18
Tire size:	Front	3.25 H19–4PR
	Rear	4.00 H18–4PR
Final reduction ratio		3.071 (43/14)
Chain type		#630, 96 links

Item		Service limit
Rim runout		2.0 mm (0.080 in.)
Ball bearing:	Face runout	0.1 mm (0.004 in.)
	Radial runout	0.05 mm (0.002 in.)
Drive chain		369.2 mm (14.535 in.)/20 pins
Tire tread depth:	Front	1.6 mm (0.060 in.)
	Rear	2.0 mm (0.080 in.)

TROUBLE-SHOOTING

Symtom	Probable cause	Remedy
Hard steering, or slipping tires in cornering or braking	1. Low tire pressure	Adjust to specification pressure
	2. Excessively worn tire treads	Replace
Front or rear wheel wobbles	1. Worn wheel bearing	Replace the bearing
	2. Loose spokes	Retighten
	3. Wheel has excessive runout or is distorted	Repair or replace.
	4. Defective tire	Replace
	5. Wheel out of balance	Adjust
	6. Steering adjustment disturbed	Adjust

13-2. FRONT WHEEL AND TIRE

a. Description

The front tire is of size **3.25H19** with a ply rating of 4. The wheel hub is an aluminum alloy in material and carries two ball bearings, front axle distance collar and dust seal. **(Fig. 13-1)**

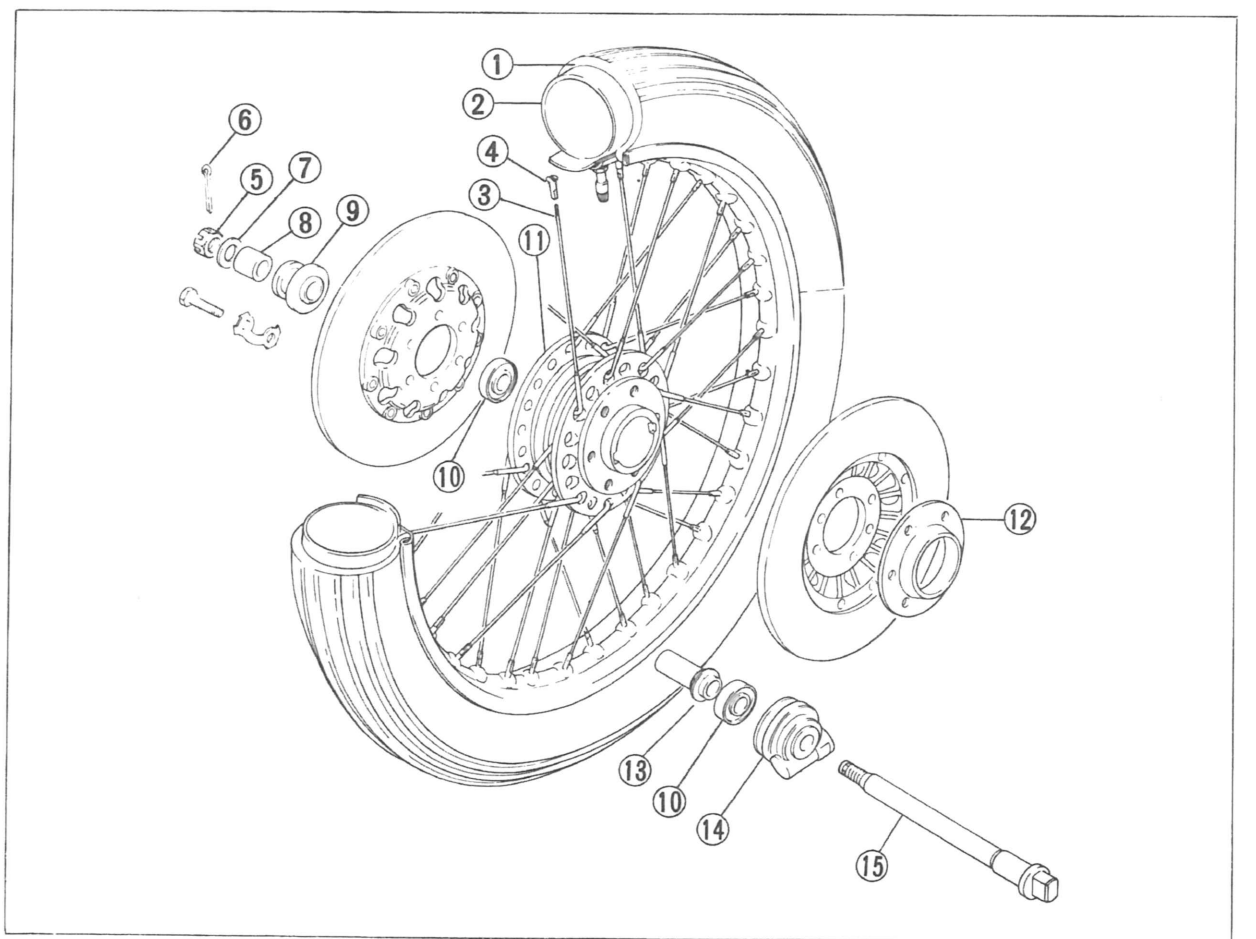

Fig. 13–1 1. *Front tire* 2. *Inner tube* 3. *Spoke* 4. *Spoke nipple* 5. *Front axle nut* 6. *Cotter pin* 7. *Washer* 8. *Spacer* 9. *Spacer* 10. *Ball bearing* 11. *Wheel hub* 12. *Dust seal* 13. *Distance collar* 14. *Speedometer gear box* 15. *Front axle*

b. Disassembly

1. Raise the front wheel off the ground by jacking. Keep it raised by placing a proper support under the engine.
2. Disconnect the speedometer cable from the front wheel hub assembly. **(Fig. 13-2)**
3. Detach the left-hand caliper with the brake hose left connected to it. **(Fig. 13-3)**
4. Remove the nuts securing the front axle holders. Take off the holders and remove the wheel from the front fork.

   Note: Do not depress the brake lever when the wheel has been removed.
5. Pull off the cotter pin and loosen the front axle nut. Remove the nut and pull out the front axle. **(Fig. 13-4)**

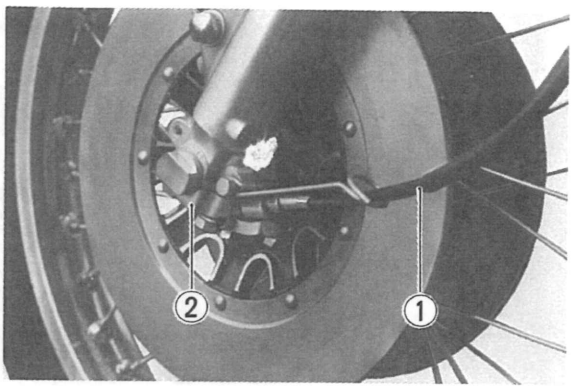

Fig. 13–2 1. Speedometer cable 2. Front axle holder

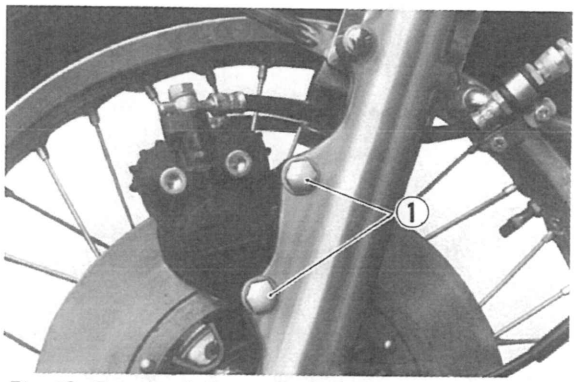

Fig. 13–3 1. Caliper mounting bolt

6. From the wheel hub, remove the bearings and spacers. **(Fig. 13-5)**
7. Using the tire levers, pry the tire out of the wheel rim, and remove the tire and tube. **(Fig. 13-6)**

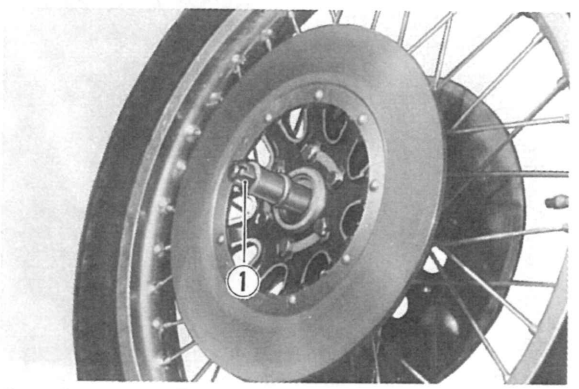

Fig. 13–4 1. Front axle nut

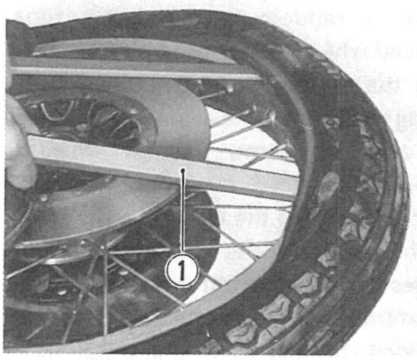

Fig. 13–6 1. Tire lever

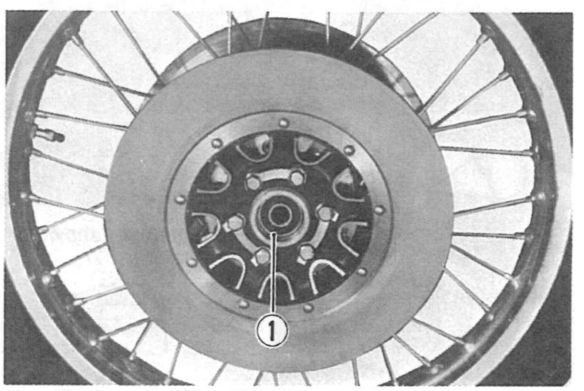

Fig. 13–5 1. Wheel bearing

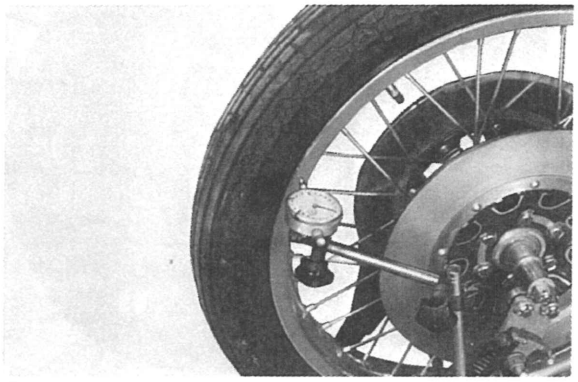

Fig. 13–7

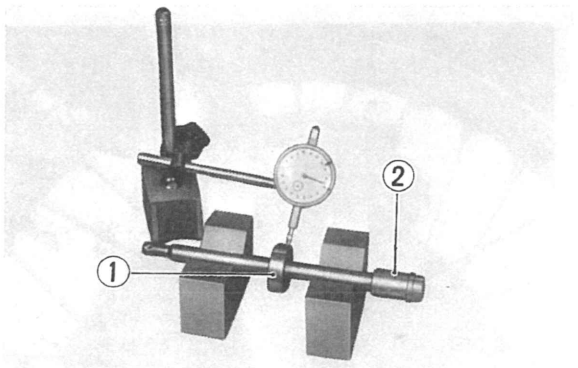

Fig. 13–8 1. Ball bearing 2. Front axle

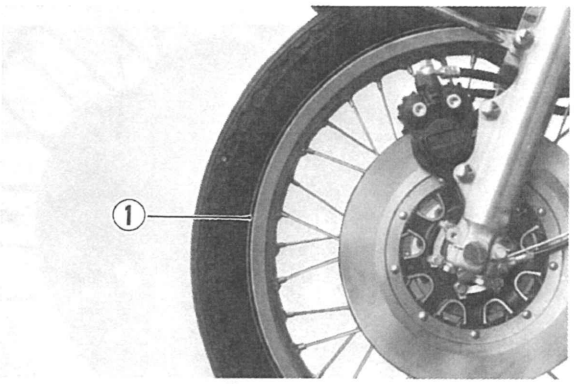

Fig. 13–9 1. Tire bead line

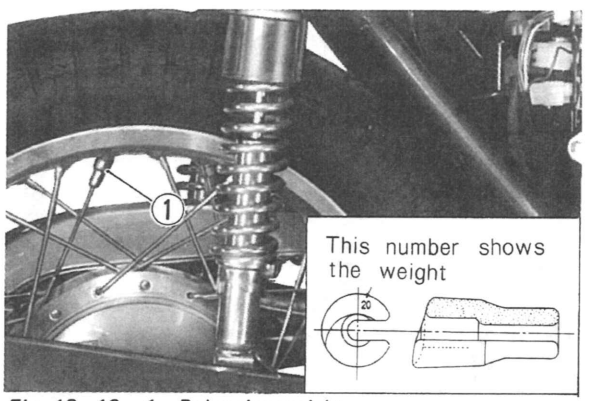

Fig. 13–10 1. Balancing weight

c. Inspection

1. Check the wheel rim for runout in the following manner: Pass the shaft through the wheel hub and clamp the other end of the shaft to hold the wheel upright and free to run; rig up the dial gauge, with the spindle pointing squarely against the rim, and rotate the wheel to read the runout. This is a face runout, which should be not greater than **2.0 mm (0.080 in.).** If a greater runout is noted, repair or replace the rim. **(Fig. 13-7)**

2. Check each bearing for radial and face runouts, as shown in **Fig. 13-8.** Re-use or replace the bearing according as the radial or face runout is within the service limit or not.

Item	Service limit
Face runout	0.1 mm (0.004 in.)
Radial runout	0.05 mm (0.002 in.)

3. Inspect the front wheel hub for evidence of cracking. A cracked hub must be replaced.

4. Check the seating width of the tire bead to make sure it is uniform all around. If the width is large in some part and small in other, inflate the tire to **5 kg/cm^2 (71 psi)** and then deflate it to the specification pressure: this will settle the tire on the rim. **(Fig. 13-9)**

5. Test the wheel for balance by spinning it in free, floating condition. Spin the wheel several times; if the wheel is in balanced condition, it will halt at a random position each time. An unbalanced wheel is evidenced by its halting at one and the same angular position.

   Belancing weights are available in two types, **20 grams** and **30 grams.** If the wheel is evidently in unbalanced condition, statically balance it by attaching the weight to the spoke nipple at the top (opposite to the heavy spot, which comes to the bottom when the wheel halts). Determine the number and type of weights needed through trials, and install them by locking with pliers. **(Fig. 13-10)**

6. Check the tire tread depth. The tread wear limit is **1.6 mm (0.06 in.)** in terms of tread depth. A tire found to have reached this limit must be replaced. **(Fig. 13-11)**
   Caution: Each RE5 user should be reminded of the importance of using GENUINE SUZUKI tires in his RE5 motorcycle.
7. For the prescribed tire inflating pressure, refor to **GROUP 16, page 145.**

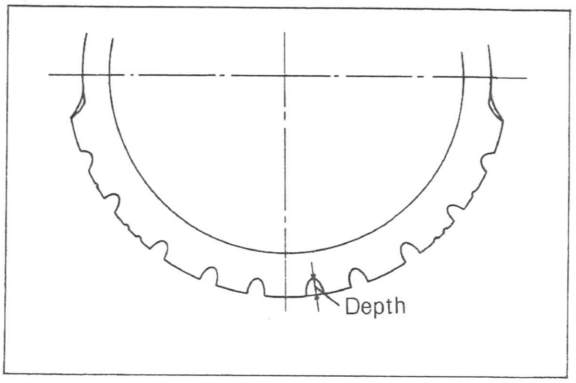

Fig. 13–11

d. Reassembly

1. When fitting the tire and tube to the wheel rim, be sure to position the tire so that the balancing mark (a white or blue dot printed on the tire bead) comes right under the inner-tube valve. **(Fig. 13-12)**

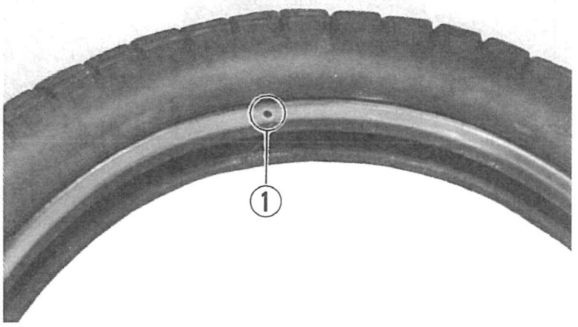

Fig. 13–12 1. Balansing mark

2. Fit the ball bearings and spacers into the front hub.
3. Insert the front axle through the speed-ometer gear box from left side, and tighten the axle nut to **360** to **520 kg-cm (26 ~ 38 ft-lb).**
4. Mount the front wheel on the forks, install the axle holders and secure them by tightening the nuts to **130** to **230 kg-cm (9.5 ~ 17 ft-lb).** Before tightening these nuts, position the speedometer gear box to bring its arrow mark to the top side. **(Fig. 13-13)**
5. Attach the left-side caliper and secure it by tightening its bolts to **250** to **400 kg-cm (18 ~ 29 ft-lb).**

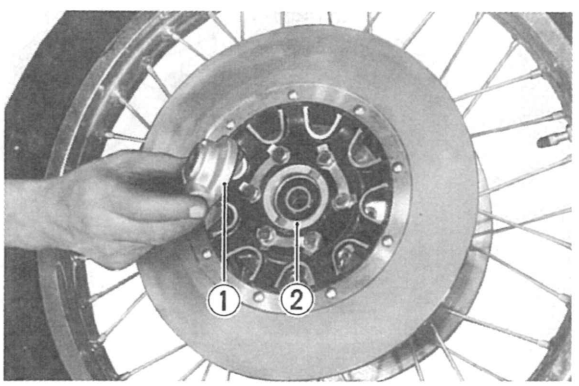

Fig. 13–13 1. Speedometer gear box
2. Wheel hub

13-3. REAR WHEEL AND TIRE

a. Description

The rear wheel is fitted with a **4.00H18-4PR** tire. The wheel hub, which is an aluminum-alloy casting, contains two ball bearing and spacers, and is complete with the final drive flange and brake panel.

Damper cushions are mounted within the wheel hub to absorb the vibrations and shocks coming from the final driven sprocket. These cushions are of hard rubber. **(Fig. 13-14)**

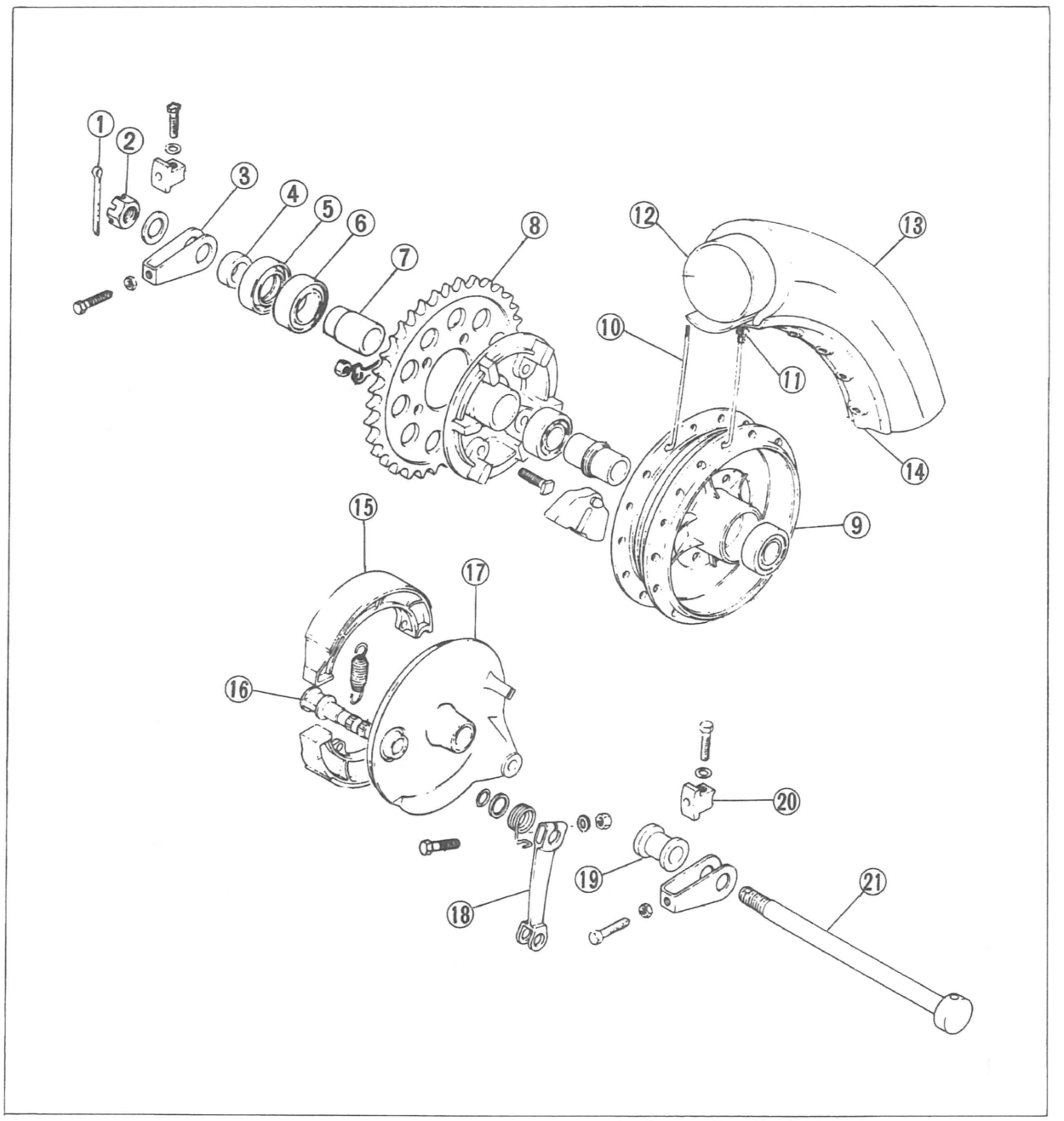

Fig. 13–14 1. *Cotter pin* 2. *Rear axle nut* 3. *Chain adjuster* 4. *Spacer* 5. *Oil seal* 6. *Ball bearing* 7. *Spacer* 8. *Final driven sprocket* 9. *Rear wheel hub* 10. *Spoke* 11. *Spoke nipple* 12. *Inner tube* 13. *Rear tire* 14. *Rim* 15. *Brake shoe* 16. *Brake cam* 17. *Brake panel* 18. *Brake cam lever* 19. *Spacer* 20. *Chain adjuster support* 21. *Rear axle*

b. Disassembly

1. Set the motorcycle on the center stand.
2. From the brake cam lever, remove the rear brake adjusting nut and brake rod. **(Fig. 13-15)**
3. Remove the "β" type lock pin, and loosen the rear torque link nut. Take off the torque link. **(Fig. 13-15)**
4. Pull cotter pin off the right end of the rear axle, and loosen the axle nut. **(Fig. 13-16)**
5. Loosen the nuts on drive chain adjusting bolts. Back away the bolts, and turn the chain adjusters downward. Remove the bolts securing chain adjuster supports, and take off the supports. **(Fig. 13-16)**
6. Push the wheel forward, lifting the chain off the final driven sprocket; then pull the wheel backward clear of the rear swing arm.
7. Remove the rear wheel assembly from the frame.
8. Unlock the nuts by straightening the tongues of washers on the driven sprocket. Remove the nuts, and take off the driven sprocket. **(Fig. 13-17)**
9. Separate the brake panel and sprocket drum from the hub, as shown in **Fig. 13-17.**
10. Using the tire levers, pry the tire out of the wheel rim, and remove the tire and tube.

c. Inspection

1. Inspect the rear hub, brake panel, sprocket drum and spokes for damage. Cracked or otherwise badly damaged parts must be replaced.
2. Check each ball bearing for raidal and face runouts in the manner described for those of the front wheel. Re-use or replace the bearing according as the radial or face runout is within the service limit or not:

Item	Service limit
Face runout	0.1 mm (0.004 in.)
Radial runout	0.05 mm (0.002 in.)

3. Check the wheel rim for runout in the manner described for the front wheel. If a runout greather than **2.0 mm (0.080 in.)** is noted, repair or replace the rim.
4. Test the wheel for balance and, as necessary, balance it by attaching a proper amount of balancing weights. The method described for the front wheel applies.

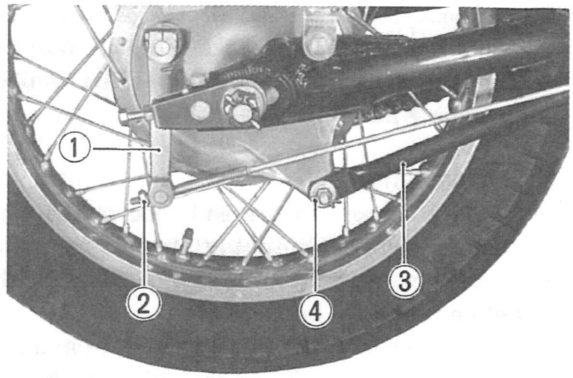

Fig. 13–15 1. *Brake cam lever*
2. *Rear brake adjusting nut*
3. *Torque link*
4. *"β" type pin*

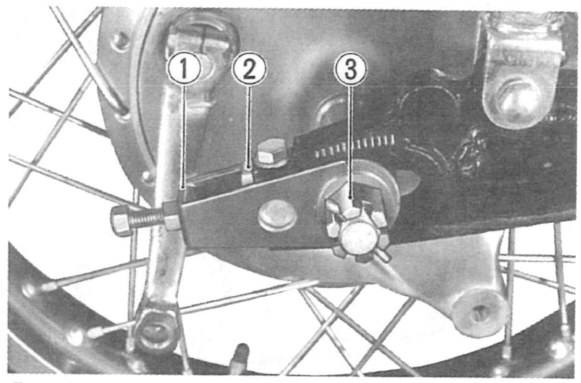

Fig. 13–16 1. *Chain adjuster*
2. *Chain adjuster support*
3. *Rear axle nut*

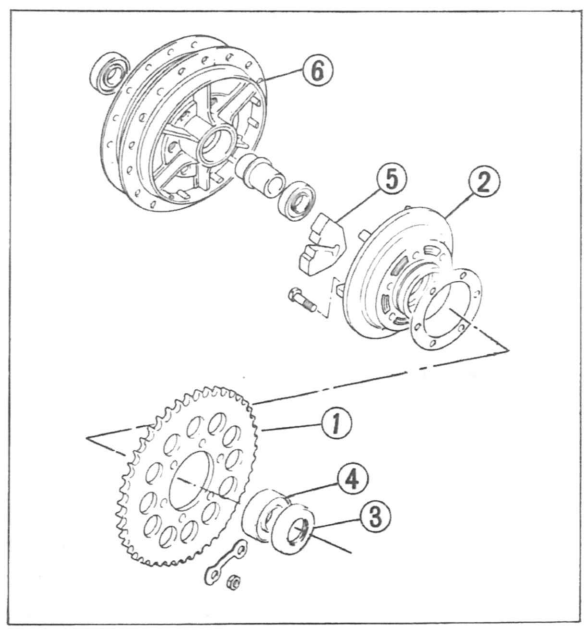

Fig. 13–17 1. *Final driven sprocket*
2. *Sprocket drum*
3. *Oil seal*
4. *Ball bearing*
5. *Cushion*
6. *Wheel hub*

5. Check the tire tread depth. The tire tread wear limit is **2.0 mm (0.08 in.)** in terms of depth. A tire found to have reached this limit must be replaced.

Caution: Each RE5 user should be reminded of the importance of using GENUINE SUZUKI tires in his RE5 motorcycle.

d. Reassembly

1. When fitting the tire and tube to the wheel rim, be sure to position the tire so that the balancing mark (a white or blue dot printed on the tire bead) comes right under the innertube valve.
2. Make sure that the internal surfaces of the brake drum are clean, free from any dust or oil stains, before fitting the brake panel.
3. When securing the rear sprocket drum and sprocket, be sure to tighten the sprocket nuts to a torque value of **250** to **400 kg-cm (18 ~ 29 ft-lb)**, and to lock each nut positively by bending the washer tongue.
4. After installing the rear wheel, adjust the drive chain for proper tension by positioning the adjuster bolts so that the top span of the chain will exhibit a sag of **15** to **20 mm (0.6 ~ 0.8 in.)**, as shown in **Fig. 13-18**. It is after making this adjustment that the axle nut should be tightened. The prescribed tightening torque for this nut is **850** to **1150 kg-cm (62 ~ 84 ft-lb)**. Be sure to lock the axle nut securely by inserting new cotter pin.

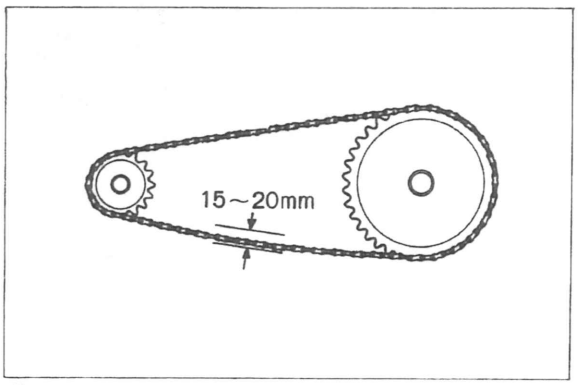

Fig. 13–18 1. Final drive chain

5. The prescribed tightening torque for the rear torque link nut is **200** to **300 kg-cm (14 ~ 18 ft-lb)**. Be sure to lock this nut by installing the "β" type pin.
6. Adjust the rear brake pedal to the prescribed play, the value of which is stated in **GROUP 16, page 145.**

13-4. FINAL DRIVE

a. Description

The drive chain transmits power from the final drive sprocket to the driven sprocket mounted on the rear wheel.

b. Disassembly

1. The rear wheel must be removed from the machine in order to permit disassembly of the final drive. Rear wheel removal is described in the preceding section.
2. Loosen the nut securing the rear swing arm, and remove the arm from the frame.
3. Remove the two screws securing the clutch release inspection cap, and take off the cap. Remove the engine sprocket cover; five Allenhead bolts must be removed to free this cover.
4. Remove the chain from the drive sprocket.

c. Inspection

1. Check the drive chain for stretch in the following manner: Lay the chain flat on the table top, as shown in **Fig. 13-19;** and, while keeping it in slight tension to take up plays, if any, at the pins, measure the length of **20** chain links, pin center to pin center. The service limit in terms of this length is **369.2 mm (14.535 in.).** If this limit is exceeded, replace the chain. Twenty pins in a new chain measures **361.95 mm (14.250 in.).**
2. Visually inspect the full length of the chain for signs of cracking. A cracked chain must be replaced.
3. Similarly inspect the sprocket teeth. Chipped or otherwise broken or excessively worn teeth disqualify the sprocket for re-use.
4. Thoroughly clean the drive chain by washing and, before fitting to the sprockets, oil it liberally. Use the chain lube oil or engine oil, **SAE #30,** for this purpose.

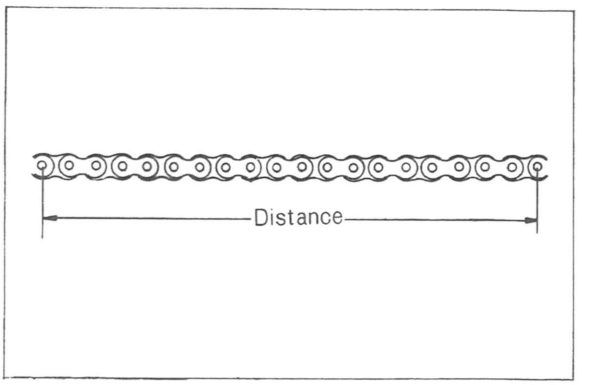

Fig. 13–19 Check the chain strech

d. Reassembly

Reassembly is the reverse of disassembly, and is to be carried out with the a torque wrench for tightening bolts and nuts to secure the engine sprocket cover and rear swing arm. Tighten the Allen-head bolts to **80** to **90 kg-cm (6.0 ~ 6.6 ft-lb),** and the swing arm pivot shaft nut to **500** to **750 kg-cm (36 ~ 54 ft-lb).**

BRAKES

GROUP 14

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14-1. GENERAL DESCRIPTION

SPECIFICATIONS

Item	Standard value	Service limit
Front brake disc thickness	7.00 mm (0.276 in.)	6.00 mm (0.236 in.)
Front brake disc deflection	0.1 mm max. (0.004 in.)	0.3 mm (0.012 in.)
Master cylinder bore diameter	15.87~15.91 mm (0.625~0.626 in.)	15.92 mm (0.627 in.)
Master cylinder piston diameter	15.83~15.85 mm (0.623~0.624 in.)	15.81 mm (0.622 in.)
Caliper cylinder bore diameter	38.18~38.20 mm (1.503~1.504 in.)	38.22 mm (1.504 in.)
Caliper cylinder bore diameter	38.15~38.18 mm (1.502~1.503 in.)	38.10 mm (1.500 in.)
Rear brake drum diameter	180 mm (7.09 in.)	180.7 mm (7.11 in.)
Rear brake shoe diameter	180 mm (7.09 in.)	176 mm (6.93 in.)

TROUBLE-SHOOTING

Symptom	Probable cause	Remedy
Brake does not apply fully to front wheel	1. Not enough brake fluid in the reservoir 2. Air is trapped in the hydraulic line 3. Brake pads worn down 4. Worn pistons in the calipers 5. Worn or distorted brake disc 6. Friction faces of pads are dirty with oily matter 7. Leaky joints or connections	Replenish Carry out air bleeding operation Replace Replace Replace Clean disc and pads Retighten, or replace defective parts
Front brake squeaks	1. Pads are cocked in place 2. Return port clogged in master cylinder 3. Worn pads 4. Pads stuck to caliper holder	Set pads right Clean Replace Disassemble and apply grease to sliding edge face of pad
Brake does not apply fully to rear wheel	1. Worn brake drum 2. Worn brake shoes 3. Cracked torque link	Replace Replace Replace

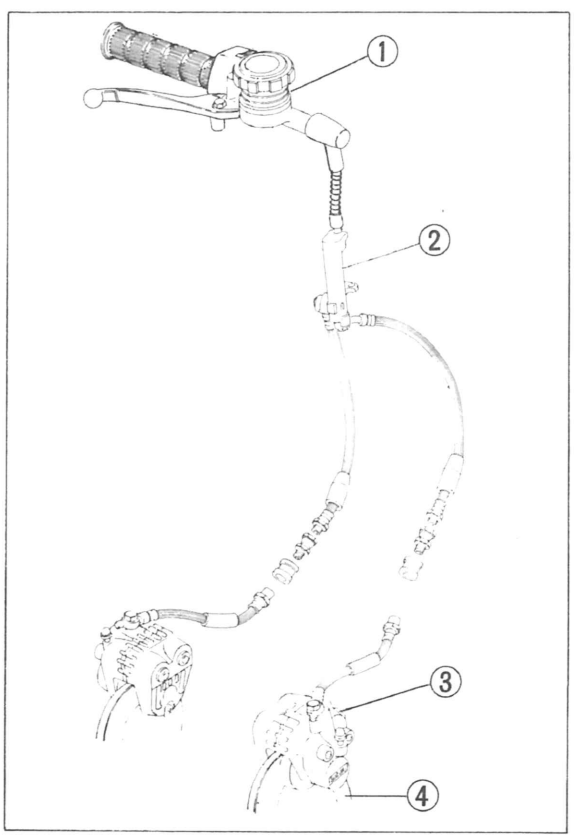

Fig. 14–1 1. Master cylinder 2. Three-way joint 3. Caliper 4. Brake disc

14-2. FRONT BRAKE

a. Description

A twin-caliper, hydraulic disc brake is used for the front brake. The advantage of a disc brake is the smooth, stable braking action it is capable of for a wide range of cruising speeds, from low to high

As a system, the disc brake consists of the brake lever, master cylinder (mounted on the right handle bar), two calipers (one on each side of the front forks), and two stainless-steel discs (mounted on the front wheel hub). **(Fig. 14-1)**

How the master cylinder operates will be described first, and the calipers next:

Master cylinder operation

When the brake lever is squeezed, the squeezing force is transmitted to the piston ③ in the master cylinder through brake lever cam ②, and then to the pistons in the calipers by the brake fluid through hoses. A large **mechanical advantage** is involved in converting the push on piston ③ to a hydraulic pressure within the master cylinder.

Fig. 14-2 identifies the parts involved in the

operation of the master cylinder, and shows the cylinder in the initial state of a braking action.

Note that the brake fluid ahead of piston ③ is forced through check valve ⑥ as the piston advances. Primary cup ④, held against piston by spring ⑦, seals the sliding clearance. Secondary cup ⑨ acts similarly.

Fig. 14-3 shows the state of the master cylinder just when the brake lever is released. At this very moment, the brake fluid (which is in pressurized condition) in the hose is prevented from flowing back into the master cylinder because of check valve ⑥. Return spring ⑦ pushes the piston in the direction of the arrow and this reduces the pressure of fluid trapped between check valve ⑥ and primary cup ④. Into this low-pressure region temporarily created, fluid flows through three drafting holes Ⓐ (provided in the piston) and past the periphery of cup ④ to help the piston move back. Brake fluid in the reservior ① flows into the bore through inlet port ⑧.

Because the pressure inside the master cylinder is now low, the remaining pressure in the hose lifts the whole body of check valve ⑥, as shown in **Fig. 14-4.** When this state is reached, the fluid in the hose flows back to reduce the hydraulic pressure to zero and, as primary cup ④ moves past return port ⑤, the returning fluid enters the reservoir ①.

Caliper operation

Fig. 14-5 shows the caliper in which the hydraulic pressure transmitted from the master cylinder is rising. **Fig. 14-6** depicts the caliper in fully braking condition.

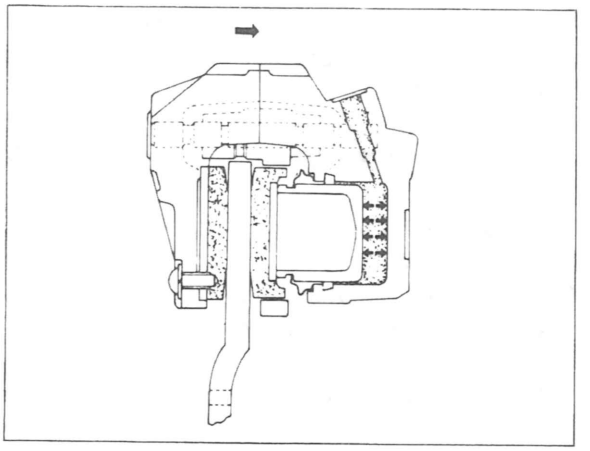

Fig. 14–6

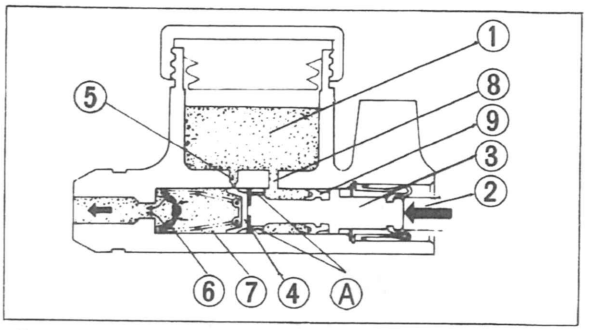

Fig. 14–2
1. Reservoir 2. Brake lever cam
3. Piston 4. Primary cup
5. Return port 6. Check valve
7. Spring 8. Inlet port
9. Secondary cup

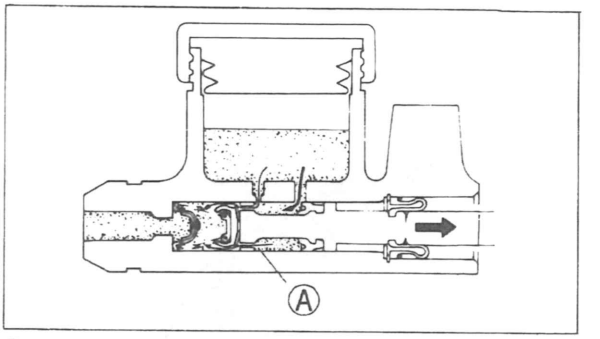

Fig. 14–3

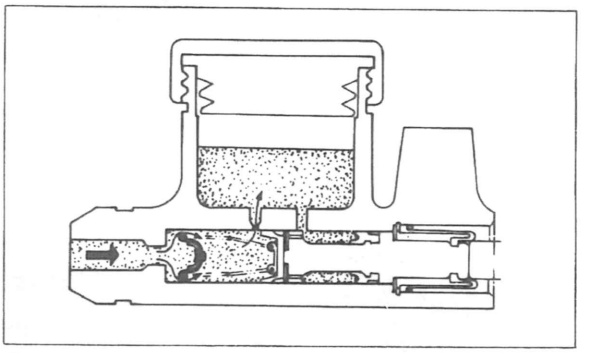

Fig. 14–4

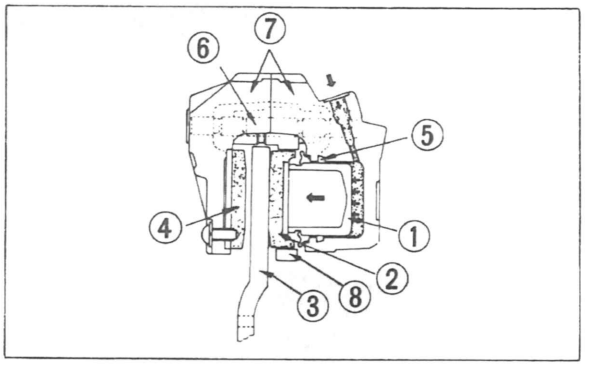

Fig. 14–5
1. Piston 2. Pad No.1
3. Brake disc 4. Pad No.2
5. Piston seal 6. Caliper axle
7. Caliper body 8. Caliper holder

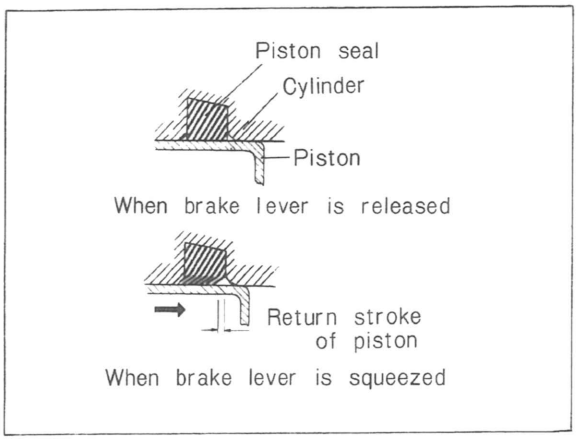

Fig. 14–7

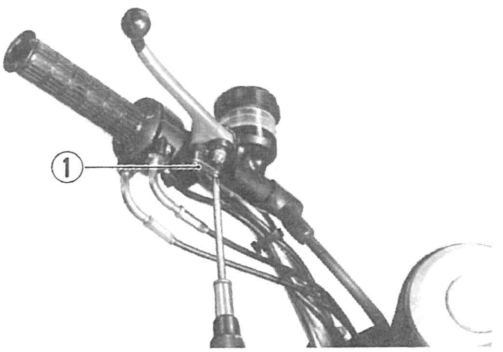

Fig. 14–8 1. Stop lamp switch

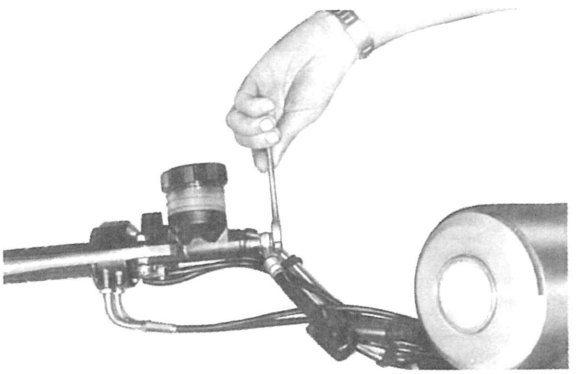

Fig. 14–9

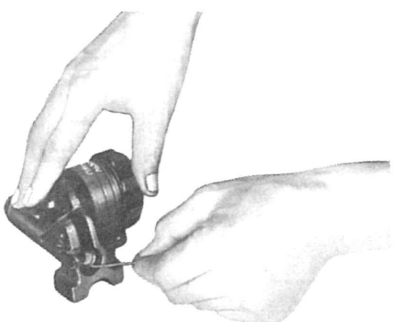

Fig. 14–10

It is important to note here that pad No. 1 ②, pad No. 2 ④ and piston ① are all carried by caliper body ⑦, this body itself is in a floating condition as supported by caliper axle ⑥. Thus, as piston ① pushes pad No. 1 against disc ③, body ⑦ pushes pad No. 2 against disc ③ by reaction. There would be no reaction if the body were clamped rigidly to, say, axle ⑥ or some stationary member.

Another important feature to be considered is the dual action of piston seal ⑤, which is made of a resilient material and surrounds the piston ① as shown in the cross sectional view of **Fig. 14-7**. Normally, the seal ⑤ is stuck to piston ① as if it were glued to it, and this explains why piston ① is capable of returning to its released position when the hydraulic pressure falls to zero.

Still another feature, not illustrated, is that, as the pads wear progressively, the position on the piston at which the seal ⑤ embraces it shifts back to compensate for the wear. This means that a larger percentage of pad thickness is serviceable than otherwise.

b. Disassembly

1. Remove the stop lamp switch from the master cylinder by unscrewing it. **(Fig. 14-8)**
2. Loosen the union bolt on the master cylinder, with a piece of cloth placed under it to catch leaking fluid, and disconnect the hose. **(Fig. 14-9)**
3. Remove the two bolts securing the master cylinder to the handle bar, and take off the cylinder. Empty the reservoir.
4. Remove the brake lever.
5. Carefully remove the boot stopper so as not to damage the boot, and remove the boot. **(Fig. 14-10)**
6. Remove the circlip with the **circlip remover (Tool No. 19920-73110),** as shown in **Fig. 14-11.**
7. Take out the piston, primary cup, spring and check valve.
8. Place the removed parts in a clean container, and wash them in fresh brake fluid.

Caution: Never wash them in gasoline or any petroleum derivative or rubber parts will be badly affected.

9. Disconnect the brake hose from each caliper by loosening the union bolt at the top side of the caliper. Remove the bolts securing the caliper in place, and take off the caliper. See **Fig. 14-12.**

10. Unscrew the caliper axle bolts with the **8-mm L-type hex wrench (Tool No. 09900-06904).** Separate the inner caliper body from the outer one. See **Fig. 14-13.**

11. Remove the caliper holder, and undo "O" rings on the caliper axle.
12. Remove the caliper axles.
13. Remove the piston boot.
14. While holding the piston with fingers to prevent it from jumping out, apply compressed air to force the piston out.

15. Remove the piston seal, as shown in **Fig. 14-14.**
16. Wash the piston, piston boot, piston seal and "O" rings (or caliper axles) with fresh brake fluid.

Caution: As in the case of rubber parts of the master cylinder, do not wash these removed parts in gasoline or any petroleum derivative.

17. Remove the three-way joint from the steering stem. The joint comes off when its two mounting bolts are removed. **(Fig. 14-15)**

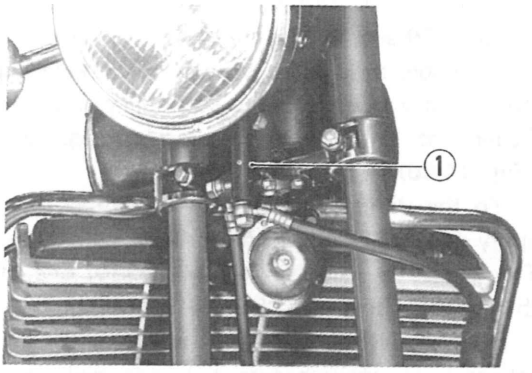

Fig. 14–15 1. Three-way joint

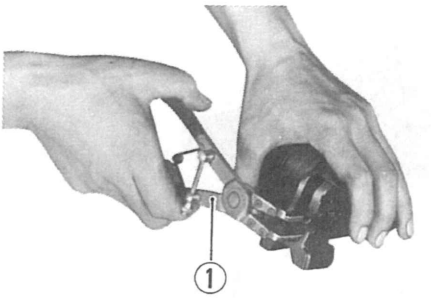

Fig. 14–11 1. Circlip remover

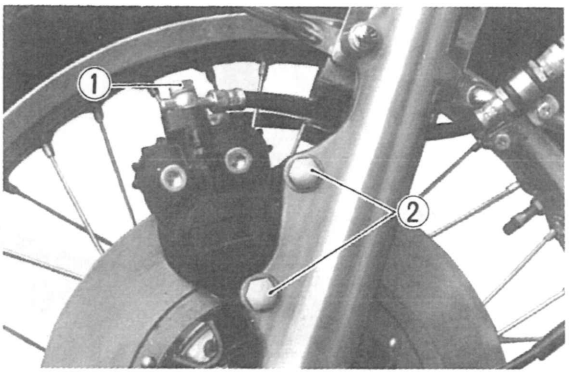

Fig. 14–12 1. Union bolt
2. Caliper mounting bolt

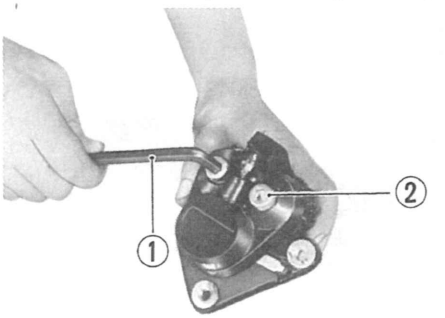

Fig. 14–13 1. 8mm hexagon L-type wrench
2. Caliper axle bolt

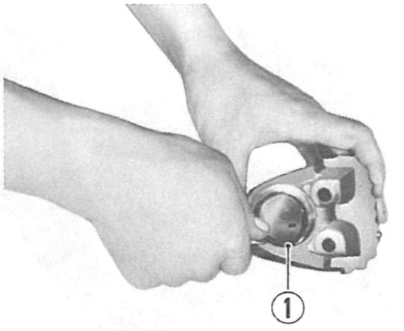

Fig. 14–14 1. Piston seal

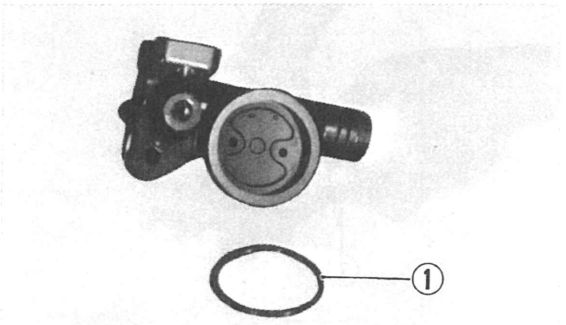

Fig. 14–16 1. "O" ring

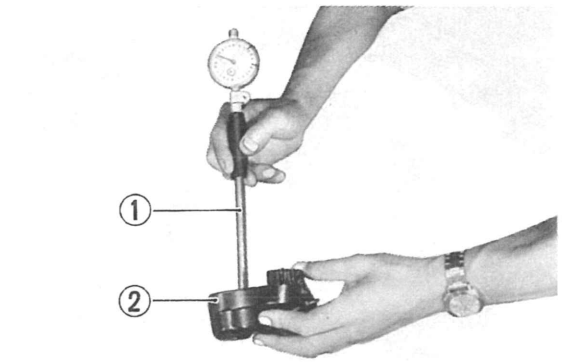

Fig. 14–17 1. Cylinder gauge 2. Caliper

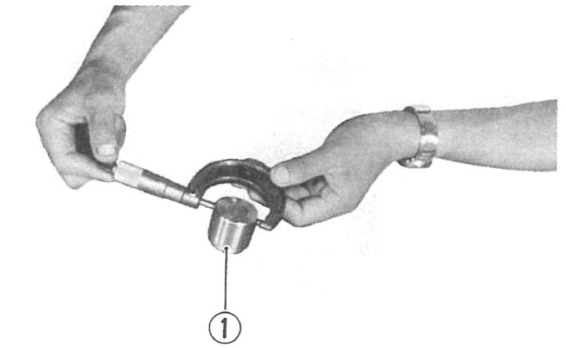

Fig. 14–18 1. Caliper piston

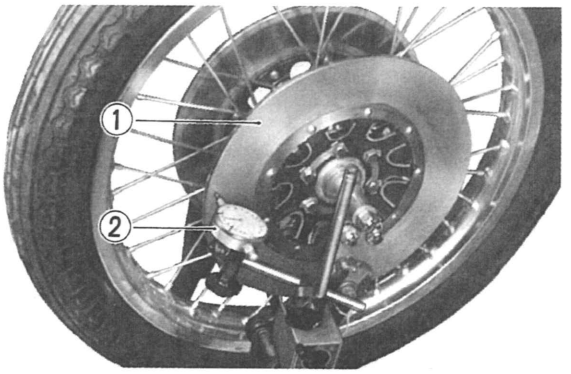

Fig. 14–19 1. Brake disc 2. Dial gauge

c. Inspection

1. Check the master cylinder bore for wear by miking its diameter. If a reading exceeding **15.92 mm (0.627 in.)** results, replace the master cylinder.
2. Mike the master cylinder piston. If the reading is less than **15.81 mm (0.622 in.)**, replace the piston.
3. Inspect the seating face of the reservoir and the seat formed on the master cylinder for evidence of fluid leakage. If leakage is suspected, replace the "O" ring. **(Fig. 14-16)**
4. Check the bore diameter of the caliper with a cylinder gauge. Replace the caliper if the reading exceeds **38.22 mm (1.504 in.). (Fig. 14-17)**
5. Mike the caliper piston, and replace it if it measures more than **38.10 mm (1.500 in.). (Fig. 14-18)**
6. Inspect all rubber parts, brake hoses, piston seals, primary cups and so on for wear, damage or any defective condition, and replace them as necessary.
7. Check each brake disc for face runout with a dial gauge, pointing its spindle to the peripheral portion of the disc. A disc exhibiting a runout of more than **0.3 mm (0.0012 in.)** must be corrected by setting to right the parts involved. The wheel bearing could be responsible or the disc itself could be in distorted condition. Replace defective parts as necessary. See **Fig. 14-19.**
8. Mike the thickness of each disc. If the reading is less than **6.00 mm (0.236 in.).** Replace the disc.

b. Reassembly

1. Install the three-way joint, securing it to the steering stem by tightening the bolts to a torque between **60** and **100 kg-cm (4.4 ~ 7.3 ft-lb).**
2. Assemble the master cylinder, discriminating the primary cup from the secondary cup and fitting the internals in the correct sequence. **(Fig. 14-20)**
3. To the sliding portion of each caliper axle, apply **SUZUKI Caliper Axle Grease** liberally. This grease is Part No. **99000-25110**, one of the specified soft materials. **(Fig. 14-21)**
4. Fit the piston seal and piston into the caliper bore, making sure that the seal takes its position true and square, without any cocking or twist.

5. Mate together the caliper halves, fit in the caliper holder, and fasten them together by tightening the caliper axle bolts to a torque anywhere between 250 and 350 kg-cm (18~25 ft-lb).
6. Coat the round edge face (refer to **Fig. 14-22**) of each pad No. 1 with **SUZUKI Brake Pad Grease (Part No. 99000-25100)**. Give a very thin coating. Then install these pads in the caliper assemblies.
7. Mount the master cylinder on the handle bar, introducing a gap of about **2 mm (0.08 in.)** between it and the throttle grip and holding the reservoir in horizontal position. Secure the master cylinder in place by tightening its clamp bolts to a torque between **50** and **80 kg-cm (3.6~5.8 ft-lb)**.
8. Install each caliper assembly. Secure it in place by torquing its mounting bolts to anywhere between **250** and **400 kg-cm (18~29 ft-lb)**.
9. Reconnect brake hoses to master cylinder, three-way joint and calipers. Make sure that each hose line is free from any twist. After tightening the union bolts to a torque between **150** and **250 kg-cm (11~18 ft-lb)**, remove the twist, if any, in each hose by turning the adaptor **(Fig. 14-23)**.
10. Fill up the brake system with the fluid, and carry out an air bleeding operation as follows:
    Note: The bleeding operation must be performed at each caliper. Let's assume that the operation is commenced on the left side.

(1) Remove the bleeder valve dust cap. Attach the bleeder tube to the bleeder valve. A transparent tube is useful as the bleeder tube because it renders air bubbles visible. See **Fig. 14-24.**

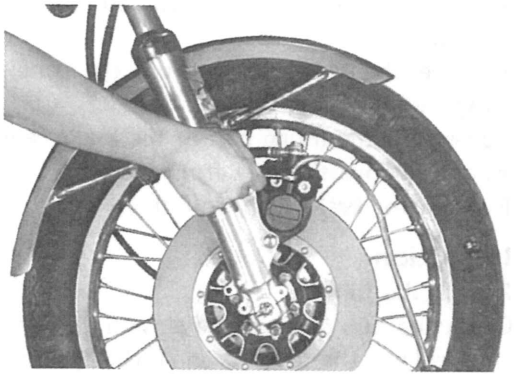

Fig. 14–24

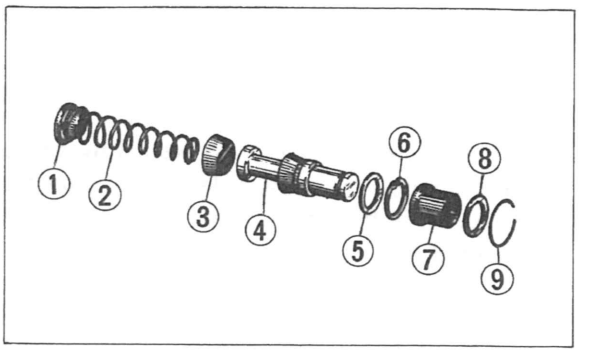

Fig. 14–20 *1. Check valve* *2. Spring* *3. Primary cup* *4. Piston* *5. Stop plate* *6. Circlip* *7. Boot* *8. Boot plate* *9. Boot stopper*

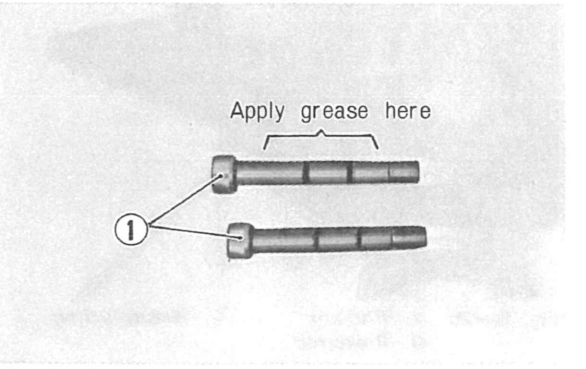

Fig. 14–21 *1. Caliper axle bolt*

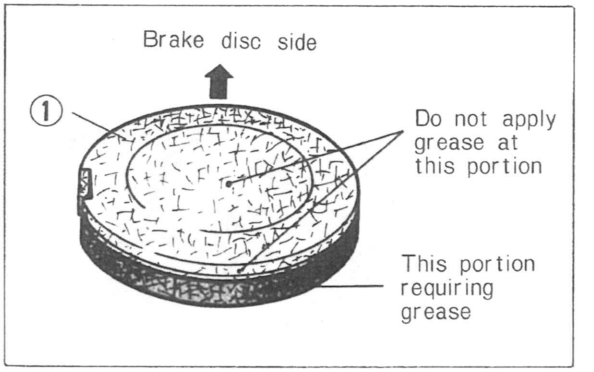

Fig. 14–22 *1. Pad No. 1*

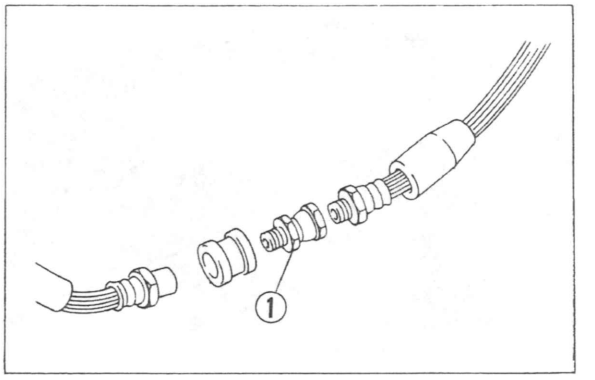

Fig. 14–23 *1. Adaptor*

(2) Stick the free end of the bleeder tube into a receptacle partially filled with brake fluid.
(3) Make sure that the reservoir on the master cylinder is full. During the bleeding operation, keep it at least half full.
(4) Put the cap on the reservoir to keep off dust.
(5) Pressurize the fluid in the system by squeezing the brake lever in a pumping fashion and terminating the pumping action by a deep final squeeze.
(6) Open the bleeder valve by turning it a half rotation. With the brake lever kept squeezed, let out the fluid into the receptacle until the air bubbles disappear in the fluid being bled out.
(7) Repeat the steps (5) and (6), as necessary, and, upon getting convinced that the trapped air is all out, close the bleeder valve securely with a wrench, tightening it to a torque between **60** and **90 kg-cm (4.3 ~ 6.5 ft-lb).**
(8) Remove the bleeder tube and put on the valve dust cap.

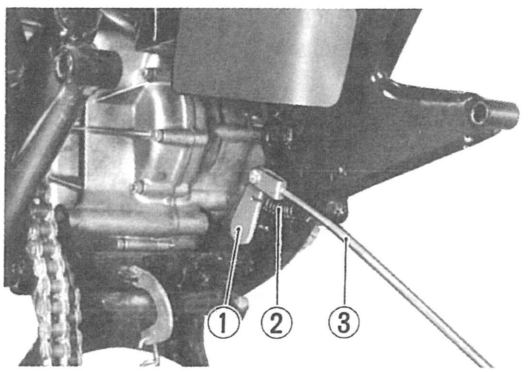

Fig. 14–25 1. Rod arm 2. Return spring 3. Brake rod

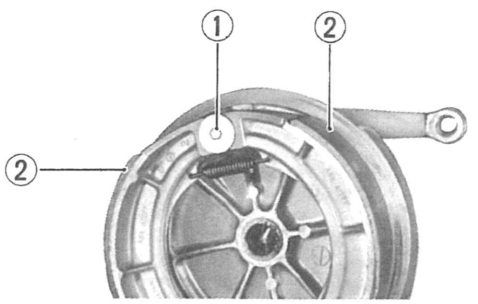

Fig. 14–26 1. Brake cam shaft 2. Brake shoe

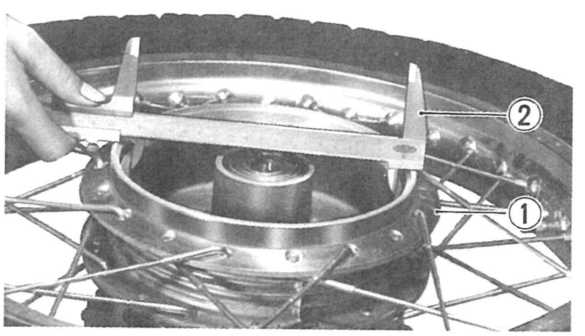

Fig. 14–27 1. Wheel hub drum 2. Caliper rule

Carry out the foregoing sequence of steps on the right side. Add brake fluid to the reservoir to raise the fluid to the upper level; install the diaphragm and diaphragm plate on the reservoir; and put on the reservoir cap.

Caution: A considerable amount of brake fluid will be caught in the receptacle. Do not re-use this fluid.

14-3. REAR BRAKE

a. Description

An internally expanding, leading-trailing type of wheel brake is used for the rear brake. The drum has a large diameter, 180 mm (7.09 in.), and makes for a large braking capacity with two shoes presenting a large total friction surface.

b. Disassembly

Remove the bolt securing the rear brake pedal, unhook the stop lamp switch spring, and take off the brake pedal from the rod arm. **(Fig. 14-25)**
2. Remove the rear brake adjusting nut, and ease off the rear brake rod from the rod arm.
3. Unhook the return spring on rod arm. Remove the rod arm **(Fig. 14-25).**
4. Remove the rear wheel as outlined in **13-3, page 123.**
5. Remove the brake shoes from the panel. See **Fig. 14-26.**
6. Loosen the mounting bolt of the brake cam lever, and remove the lever from the cam.
7. Remove the brake cam from the panel.

c. Inspection

1. **Rear Brake Lining:**

Check the hub drum diameter with a caliper rule. Replace the hub drum if the reading exceeds **180.7 mm (7.11 in.). (Fig. 14-27)**

2. **Rear Brake Shoes**

Using a caliper rule, check the outer diame meter of the two shoes in place, as shown in **Fig. 14-28.** Replace the two shoes if this caliper reading is less than **176 mm (6.93 in.).** Inspect each shoe lining for uneven wear; replace the shoes, even if the diameter reading happens to be satisfactory, where the shoes are found to be in badly worn condition.

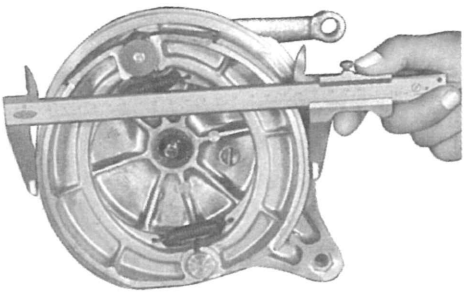

Fig. 14–28

d. Reassembly

1. Install the rod arm, securing it to the frame; and connect the brake rod to the rod arm. Be sure to use a new cotter pin to lock the brake rod in place.
2. Hook on the rear brake return spring.
3. Fit the rear brake pedal to the rod arm, with the punched match marks brought to each other as shown in **Fig. 14-29.** Secure the pedal to the rod by tightening the mounting bolt to **90** to **140 kg-cm (6.6 ~10 ft-lb).**
4. Be sure to refer to the procedure outlined in **13-3, pages 124,** when mounting the rear wheel.

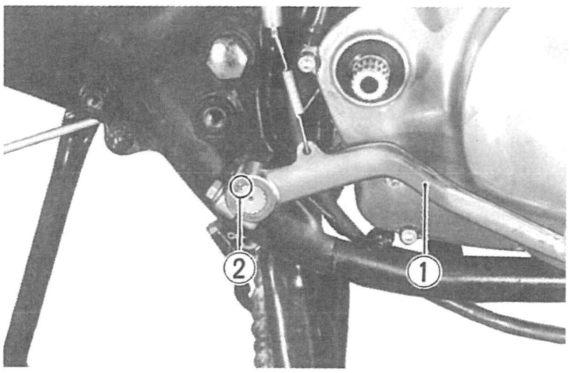

Fig. 14–29 1. Rear brake pedal
2. Punch mark

BODY ELECTRICAL & INSTRUMENTS

GROUP 15

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15-1. GENERAL DESCRIPTION

SPECIFICATIONS

Head lamps	12 volts, 50/40 watts
Tail/stop lamp	12 volts, 8/23 watts
Turn signal lamp	12 volts, 23 watts
Indicator lamps	12 volts, 3.4 watts, 1.7 watts (for turn signal indicator lamp)
Meter lamps	12 volts, 3.4 watts

TROUBLE-SHOOTING

Sympton	Probable cause	Remedy
A lamp does not light	1. Filament broken in the bulb	Replace the bulb
	2. Bulb socket is seated loose	Repair, producing metal-to-metal contact
	3. Broken lead wire	Repair or replace
Turn signal lamps do not operate	1. Inoperative turn signal relay	Replace
	2. Filament broken in the lamps	Replace
	3. Lamp socket is seated loose	Repair, producing metal-to-metal contact
	4. Broken lead wires	Repair or replace
Gear position indicator lamp does not show symbol letters	1. Inoperative gear position indicator switch	Replace the switch
	2. Defective gear position indicator	Replace
	3. Broken lead wires	Repair or replace
Horn does not sound off	1. Battery is run down	Recharge the battery
	2. Defective contact in the switch	Repair
	3. Broken wire	Repair or replace
Tachometer or speedometer does not operate	1. Broken drive cable	Replace
	2. Defective gear box.	Replace

15-2. SPEEDOMETER/TACHOMETER

a. Description

The speedometer includes an odometer and a trip meter. Drive comes from the front wheel through a flexible cable.

The tachometer is driven by the contact breaker shaft and also through a flexible cable.

The construction of the speedometer/tachometer unit is illustrated in **Fig. 15-1.**

b. Disassembly

1. The head lamp unit is secured by three screws to the head lamp housing. Remove these screws and take off the unit.
2. Disconnect the drive cables of speedometer and tachometer.
3. Uncouple the multi-lead connectors for the lead wires extending from the speedometer/tachometer and the ignition switch. The connectors are shown in **Fig. 15-2.**
4. Remove the two bolts securing the speedometer/tachometer to the head lamp housing, and remove

two more bolts securing it to the steering stem-head. Take off the speedometer/tachometer.

5. Remove the set screw on the zero-return knob shaft, and take the knob off. See **Fig. 15-3.**
6. At the back of the speedometer/tachometer, loosen the screws on the cover; and detach the speedometer/tachometer unit from the cover, as shown in **Fig. 15-4.**
7. Loosen the 10 screws on the off side of the speedometer/tachometer unit, and remove the lens.
8. The tachometer and speedometer as individual instruments come off when the two screws at the back, securing each meter, are removed.

c. Inspection

1. Speedometer:

If the speedometer does not indicate the speed, check it for the cause as follows: Disconnect the cable from the speedometer gear box, and peep through the cable hole to see whether the gear inside runs or not when the front wheel is spinned. If the gear is noted to remain standstill, replace the gear box. If the gear runs, then, inspect the inner cable and, if its inner cable is broken, replace the cable. Where both the gear and the cable are found in good condition, then the cause is within the speedometer itself and the remedy is to replace the speedometer.

2. Tachometer:

If the tachometer does not indicate the speed when the engine is running, disconnect the tachometer cable from the clutch cover

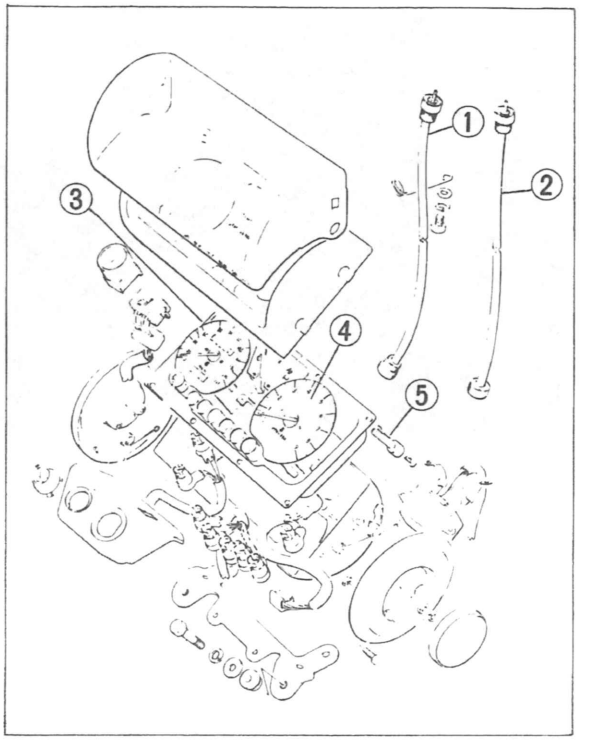

Fig. 15–1 *1. Speedometer cable*
2. Tachometer cable
3. Speedometer *4. Tachometer*
5. Trip meter knob

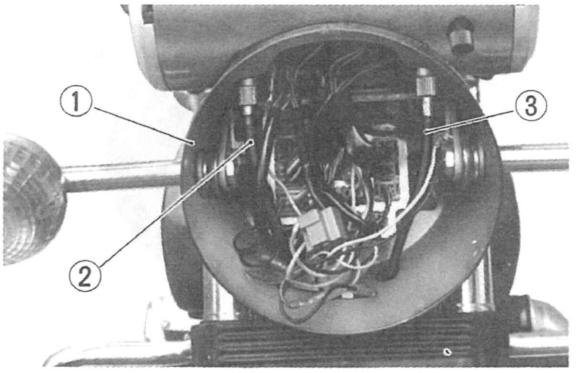

Fig. 15–2 *1. Headlamp housing*
2. Tachometer cable
3. Speedometer cable

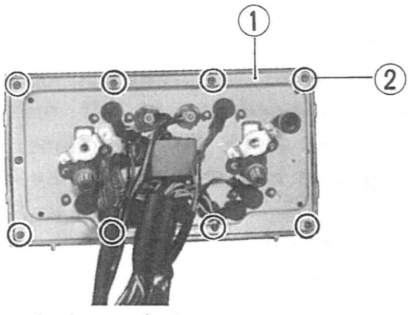

Fig. 15–4 *1. Speedo/tachometer case*
2. Screw

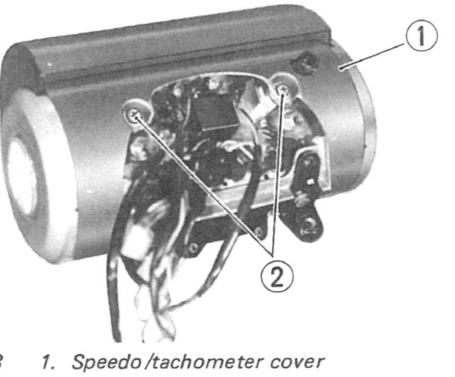

Fig. 15–3 *1. Speedo/tachometer cover*
2. Screw

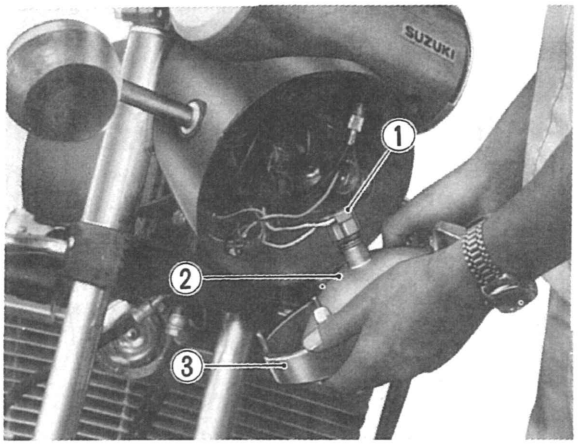

Fig. 15–5 *1. Connector* *2. Headlamp unit* *3. Headlamp rim*

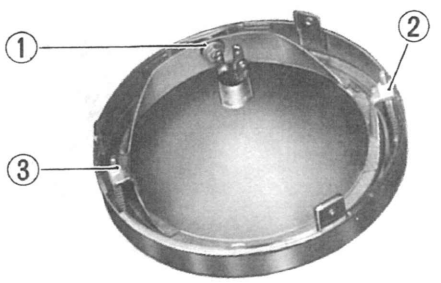

Fig. 15–6 *1. Pivot screw* *2. Vertical adjusting screw* *3. Horizontal adjusting screw*

and peep through the cable hole to see whether the shaft inside is rotating when the engine is running; if the shaft is not running, then the tachometer driven gear shaft or drive gear must be replaced. If the shaft is running, inspect the cable and, if the inner cable is found broken, replace the cable. Where both the cable drive and the cable are in good condition, then the cause is within the tachometer and the remedy is to replace the tachometer.

d. Reassembly

Reassembly is the reverse of disassembly.

15-3. HEAD LAMP

a. Description

The head lamp is of sealed beam type. It is mounted in such a way as to permit realigment of the beam direction vertically and horizontally. Two adjusting screws serve this purpose of altering the beam direction.

b. Disassembly

1. Loosen the three head lamp mounting screws, and remove the head lamp unit from the head lamp housing.
2. Disconnect the lead wires from the head lamp unit. **(Fig. 15-5)**
3. To separate the rim, remove the three screws —vertical adjusting screw, horizontal adjusting screw and pivot screw. **(Fig. 15-6)**

c. Reassembly

Reverse the foregoing disassembly procedure to reassemble the head lamp. After installing the lamp in place, adjust the beam alignment as outlined in **16-2, page 163.**

15-4. TURN SIGNAL LAMPS AND TAIL/STOP LAMP

a. Removal

Remove the two screws securing the lens to the lamp housing, take off the lens and remove the bulb. The bulb comes out when it is pushed in and twisted to the left.

b. Inspection

1. A "blown" bulb can be easily told by observing its filament.
2. If the bulb is apparently in good condition

but does not burn, check for a loose connection or an open wire. Inspect the connector in particular.

c. Installation

Perform the installation in the reverse order of the removal sequence.

15-5. TURN SIGNAL RELAY

a. Removal

1. Take down the fuel tank, as outlined in **2-2, page 9.**
2. Disconnect the leads from the turn signal relay, and remove the relay from the frame. **(Fig. 15-7)**

b. Inspection

To see whether the relay is in good condition or not, test it in the circuit arranged as shown in **Fig. 15-8.** If the **50 watts** test bulb flickers, the relay is in sound condition; if not, the relay must be replaced.

Note: It is essential that a 50 watts bulb should be used in the test circuit.

c. Installation

Install the relay by reversing the removal sequence.

15-6. FUEL LEVEL, OIL LEVEL AND OIL PRESSURE INDICATOR LAMPS

a. Description

Indicator lamps for fuel level, metering oil level and engine oil pressure are located on the speedometer/tachometer panel, as shown in **Fig. 15-9.** The lamps for fuel level and metering oil level light up to warn the rider that he has not much fuel or metering oil left in the tank, respectively. The lamp for engine oil pressure lights up when the pressure at which the engine lube oil is fed in falls to an abnormally low level.

b. Removal

1. Remove the head lamp unit as outlined in **15-3** above.
2. Remove each indicator lamp by pulling it off the panel. **(Fig. 15-10)**

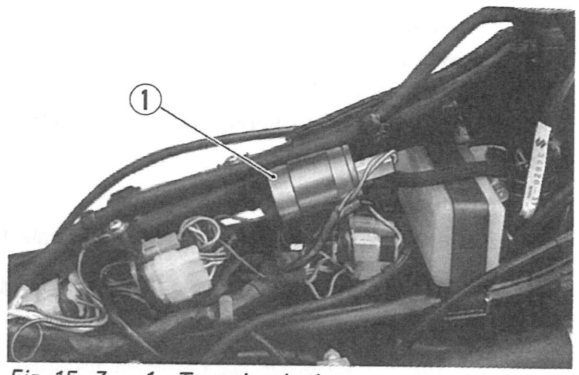

Fig. 15–7 1. Turn signal relay

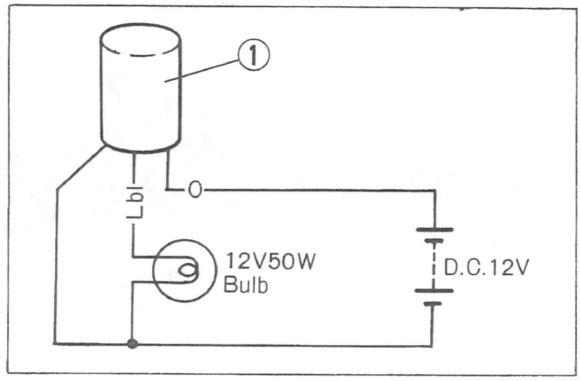

Fig. 15–8 1. Turn signal relay

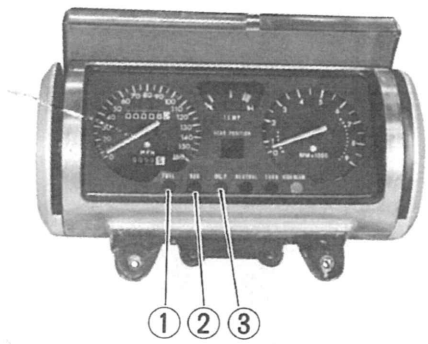

Fig. 15–9 1. Fuel level indicator lamp
2. Metering oil level indicator lamp
3. Oil pressure indicator lamp

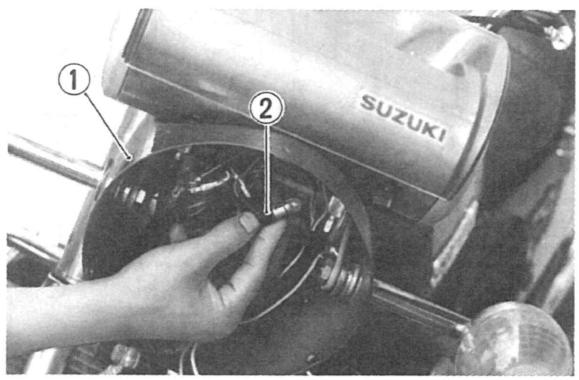

Fig. 15–10 1. Head lamp housing
2. Indicator lamp

c. Inspection

These lamps are checked in place. Turn the ignition switch into "CHECK" position: this should light up the indicator lamps for all—fuel level, metering oil level and engine oil pressure. If any lamp fails to burn, then the possible cause is a "blown" bulb, an open in the lead wire or loose contact in the multi-lead connector.

d. Installation

Reverse the removal procedure to install the lamps.

15-7. RIGHT AND LEFT HANDLE SWITCH BOXES

a. Description

The various switches are gathered together in these boxes for easier control. The right handle switch box doubles as the throttle grip holder.

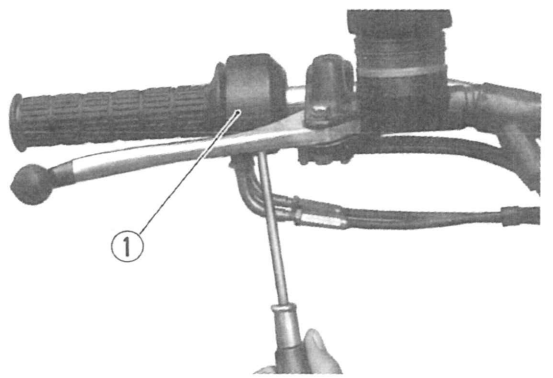

Fig. 15–11 1. Switch box

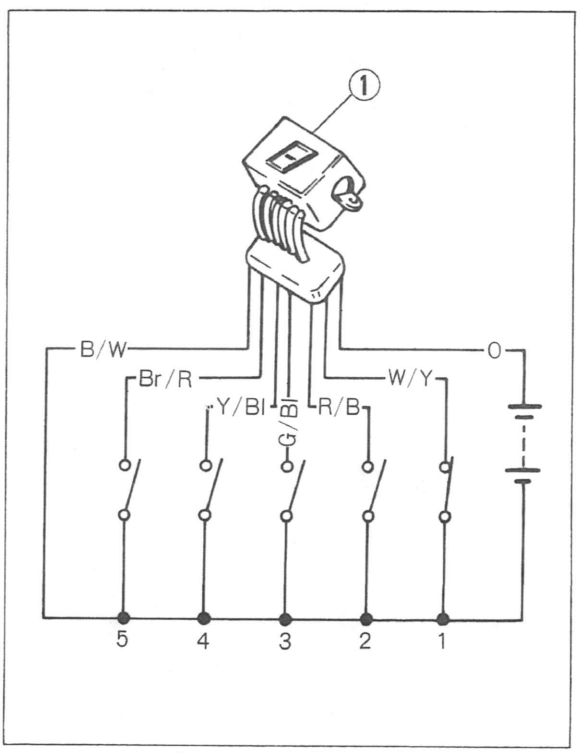

Fig. 15–12 1. Gear position indicator

b. Disassembly

1. At each switch box, loosen the two screws securing the box in place, and take off the switch box. **(Fig. 15-11)**
2. Disconnect the throttle cables from the throttle grip; then remove the throttle cable adjusters from the lower part of the right switch box.
3. Disconnect the lead wires from the head lamp housing, and remove the switch boxes.

c. Inspection

By referring to the **WIRING DIAGRAM, GROUP 17,** operate each switch to make sure it is effective. If the switch operated does not produce the result as designed, check the circuit for continuity and then check the electrical parts involved to decide the remedial measure to be taken.

15-8. GEAR POSITION INDICATOR

a. Description

This indicator is located on the speedometer/tachometer panel, and tells the gear position in the transmission. No indication occurs, however, when the transmission is in neutral, in which case the neutral indicator lamp burns instead.

b. Removal

The gear position indicator comes off when the removal procedure outlined in **15-2,** above is carried out.

c. Inspection

Test the removed indicator in the test circuit arranged as shown in **Fig. 15-12,** in order to ascertain the internal condition of the indicator. There are five leads—W/Y, R/B, G/B1, Y/B1 and Br/R—which are to be

grounded one at a time. Grounding the W/Y lead should bring up character "1"; the R/B lead, character "2"; the G/B1 lead, character "3"; the Y/B1 lead, character "4"; and the Br/R lead, character "5". If any of these characters does not show up, or if any character displayed is incomplete in shape, replace the indicator.

d. Installation

The installing procedure is the reverse of the removal procedure.

15-9. GEAR POSITION INDICATOR SWITCH

a. Description

This switch is mounted on the transmission case. It is a rotary switch, whose rotor is turned by the gear shift cam, and controls the gear position indicator.

b. Removal

Carry out the procedure described in **3-4, page 24,** to remove the gear position indicator switch. Disconnecting the lead wires from the switch frees it for closer inspection.

c. Inspection

The rotor has a line depression mark on its end face. A similar mark is provided the switch body, as shown in **Fig. 15-13.** Bring these two lines into alignment by turning the rotor and, under this condition, check for continuity between the B1 lead wire and the switch ground. This switch position corresponds to the neutral position of the gear shift cam.

From the above position of the switch, turn the rotor counterclockwise by 30°; this brings the switch into the position of "low" or the "low" position of the cam. Check for continuity between the W/Y lead wire and the switch ground. **(Fig. 15-14)**

Then turn the rotor clockwise by 60° from the above position. This brings the switch into the position of "2nd". Check for continuity between the R/B lead wire and the switch ground.

Similarly turn the rotor three times, 60° each, bringing the switch into the positions of "3rd", "4th" and "5th", respectively; at these positions, check for continuity between the switch ground and the other lead wires, G/B1, Y/B1 and Br/R. If continuity is absent at any switch position, it means that the contact points are in defective condition and, in such a case, the switch must be replaced.

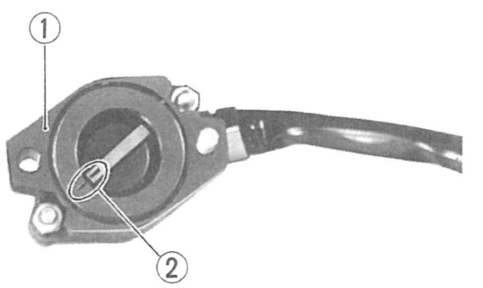

Fig. 15–13 1. Gear position indicator switch
2. Neutral position

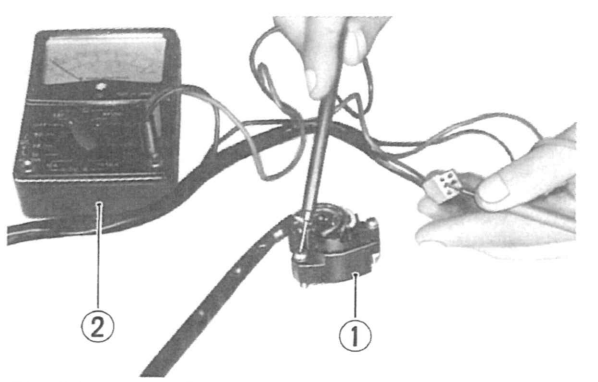

Fig. 15–14 1. Gear position indicator switch
2. Circuit tester

d. Installation

1. Before placing the switch in position, turn the rotor to its neutral position and have the transmission shifted into neutral. Under these conditions, fit the switch to the transmission case.
2. Reverse the removal procedure.

PERIODIC MAINTENANCE

GROUP 16

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16-1. MAINTENANCE SCHEDULE

A well-maintenanced motorcycle is safe to ride, trouble-free, always capable of full performance with vigor and alacrity, and economical to own and use. That's too obvious a fact, but opinions are many and varied as to the best method of maintenance. Experience tells us that, for such as motorcycles, PERIODICAL MAINTENANCE is the most practical and effective.

The maintenance schedule, which follows, is based on this philosophy. It is timed by odometer indication, and is calculated to achieve the ultimate goal of motorcycle maintenance in the most economical manner.

Service required \ Distance km (miles)	Initial 1000 (750)	Every 3000 (2000)	Every 6000 (4000)	Every 12000 (8000)	Refer to page
Engine					
Change engine oil	●	●	●	●	147
Replace engine oil filter	●		●	●	148
Clean engine oil inlet strainer	●		●	●	148
Clean spark plug	●	●	●	●	148
Adjust spark plug gap		●	●	●	148
Replace spark plug			●	●	148
Check and adjust ignition timing	●	●	●	●	149
Check ignition timing advance	●	●	●	●	150
Change contact breaker points				●	149
Grease contact breaker shaft		●	●	●	149
Adjust metering oil pump cable	●		●	●	151
Check metering oil pump discharge amount				●	151
Wash air cleaner element		●	●	●	151
Adjust engine idle speed	●	●	●	●	152
Overhaul carburetor				●	153
Lubricate throttle and clutch cables		●	●	●	153
Grease throttle grip			●	●	153
Clutch and transmission					
Adjust clutch	●	●	●	●	153
Change transmission oil	●	●	●	●	154
Cooling system					
Check concentration of anti-freeze compound	Before freezing weather sets in				154
Change coolant	Every two years				154
Change water hoses	Every two years				154
Inspect coolant level	●	●	●	●	154
Check tell-tale hole for leakage	●	●	●	●	154
Battery					
Service battery	●	●	●	●	157
Fuel system					
Service fuel system	●		●	●	157
Change fuel hoses	Every two years				157
Steering and suspension					
Check steering stem play	●		●	●	157
Change front fork oil	●				157
Grease steering ball bearings			●	●	158
Wheel and brakes					
Check tire air pressure and tread wear		●	●	●	158
Inspect front brake pads	●	●	●	●	159
Inspect brake fluid level	●	●	●	●	159

Check brake fluid leakage	●	●	●	●	159
Change front brake rubber parts	Every two years				159
Adjust rear brake pedal	●	●	●	●	160
Check rear brake shoe wear	●	●	●	●	160
Inspect rear brake linkage	●	●	●	●	160
Grease rear brake cam shaft			●	●	161
Grease rear brake rod arm			●	●	161
Adjust wheel alignment	●	●	●	●	161
Chassis and final drive					
Adjust final drive chain	●	●	●	●	161
Wash and lubricate drive chain	Every 800 km (500 miles)				161
Check final driven sprocket wear	●	●	●	●	161
Retighten bolts and nuts	●		●	●	162
Electrical equipment					
Inspect lamps and switches		●	●	●	163
Inspect horn		●	●	●	163
Inspect tachometer and speedometer		●	●	●	163

16-2. MAINTENANCE PROCEDURE

1. Change engine oil.

(1) Hold the motorcycle erect on its center stand. Take the engine oil filler plug off, and remove the oil drain plug (**Fig. 16-1**) to let out the oil. After draining, run in the drain plug and tighten it to **250 kg-cm (18 ft-lb)**.

(2) Fill in SUZUKI RE oil or its equivalent to level. Check the level with the dipstick on the filler plug. Make sure the oil is up to the upper level line. **(Figs. 16-2, 3)**

Note: In the RE5 engine, lower level is very close to upper level. This means that the engine oil level must be checked more frequently. The recommended interval is 500 km (300 miles). Make it

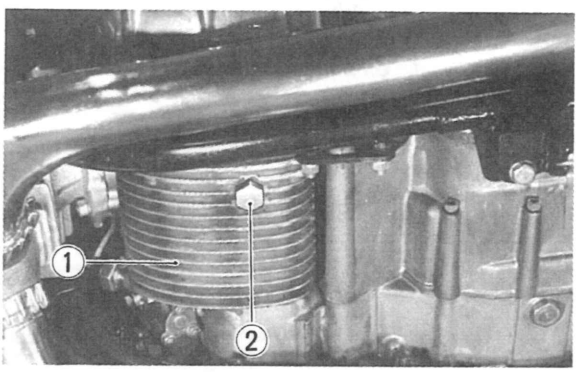


Fig. 16–1 1. Engine oil case 2. Drain prug

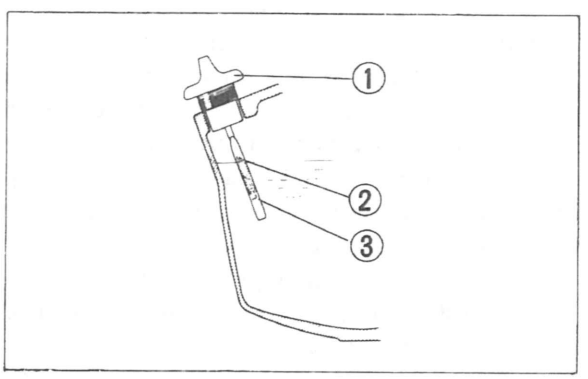


Fig. 16–3 1. Engine oil filler
2. Upper level mark
3. Lower level mark

Fig. 16–2 1. Engine oil filler

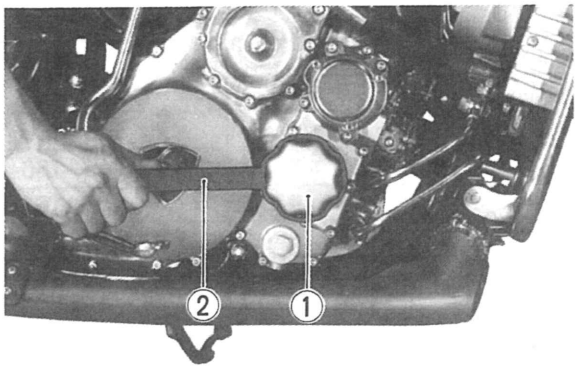


Fig. 16–4 1. Oil filter 2. Oil filter wrench

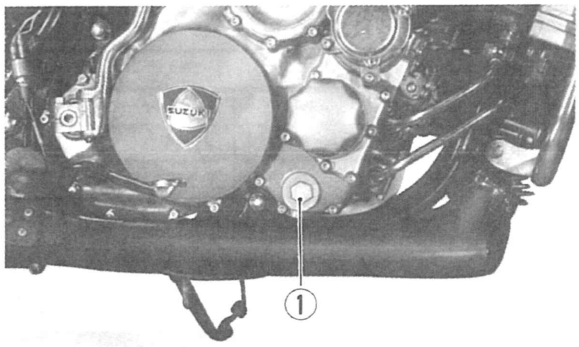


Fig. 16–5 1. Oil pump strainer plug

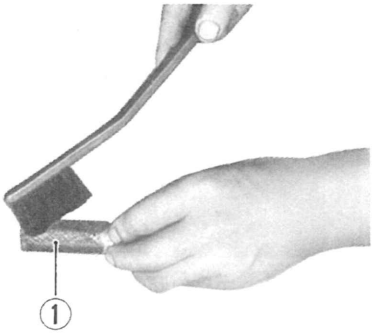


Fig. 16–6 1. Oil pump strainer

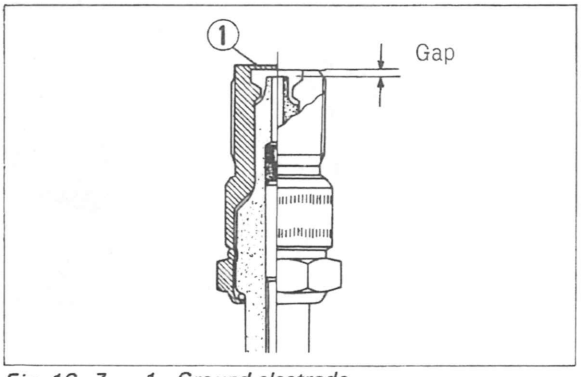


Fig. 16–7 1. Ground electrode

a rule to add oil whenever the oil is found to be below the upper level.

2. Replace engine oil filter

(1) Using the **Oil filter wrench (Tool No. 09915-43710)**, remove the filter from the clutch cover. **(Fig. 16-4)**

(2) Grease the "O" ring (on the bottom of the replacement filter) lightly, and install the filter on the cover, making it finger-tight: never use any tightening tool to install the replacement filter.

Note: **To completely fill the engine lubrication system, about 2.5 litres (4.8/4.0 US/Imp. pt.) of oil is needed, but pouring this much oil is not enough. After filling up, as described previously, start up the engine to be sure the oil pressure indicator lamp goes out and then idle it for a minute of so. One minute after this idling, re-check the oil level and add oil as necessary. Make sure that the oil is up to the upper level line on the dipstick. (Fig. 16-3)**

3. Clean engine oil inlet strainer.

(1) Remove the oil pump strainer plug and take out the strainer **(Fig. 16-5)**.

(2) Wash the strainer clean with a solvent. **(Fig. 16-6)**

(3) Install the strainer, and tighten the plug to **250 kg-cm (18 ft-lb)**.

4. Service spark plug.

(1) Disconnect the spark plug cap. Remove the plug with the **plug wrench (Tool No. 09930-10111)**.

(2) If the electrodes are found excessively worn or the porcelain broken, replace the plug.

Note: **The NGK A9EFV spark plug is specified for the rotary engine of the RE5. This plug is what NGK developed in collaboration with SUZUKI for rotary engines. It is a wide heat range plug.**

(3) To re-use the removed plug, clean the plug with a brush or a spark plug cleaner.

Note: **Never attempt to bend the electrodes in order to facilitate cleaning. The electrode might break.**

(4) Adjust the gap, as necessary. Gap specification is 0.55 mm (0.06 in.). Use a thickness gauge to check the gap. **(Fig. 16-7)**

(5) Testing the spark plug for sparking performance in the plug tester is desirable but not mandatory.

(6) Be sure to use a torque wrench when running the plug into the engine housing, and tighten it to anywhere between **250** and **350 kg-cm (18 ~ 25 ft-lb)**. This torque specification is calculated to avoid thread stripping and to ensure the necessary tightness.

5. Check and adjust ignition timing.

(1) Remove the contact breaker cover by loosening three screws on the cover. **(Fig. 16-8)** Remove the generator inspection cap, and take out the rubber plug. The hole vacated by this plug is for admitting the 17-mm T handle box wrench for turning the eccentric shaft. **(Fig. 16-9)** Fit the wrench to the head of an alternator rotor securing bolt and turn the shaft ccw (counterclockwise) until one of the two breaker contact points presents a maximized gap (with its heel slipper resting on the peak of the cam lobe). Under this condition, visually examine the point faces (movable and stationary) for cleanliness. Some grease may be found; wipe off the grease. If the faces are pitted or roughened, smoothen them with a point file and clean with a dry cloth. If the faces are badly pitted or burnt, replace the contact points by new ones.

(2) Measure the point gap with a thickness gauge. Gap specification is **0.45±0.05 mm (0.0177±0.0002 in.)**. If necessary, adjust the gap as follows:

Loosen the contact point securing screw, move the point plate by pushing it with a plain screwdriver **(Fig. 16-10)** to obtain the desired gap, and tighten the securing screw. Repeat this procedure on the other contact point.

(3) Apply grease liberally to the cam shaft, taking care not to smear the contact points.

(4) Now the two gaps are set properly. Remove the ignition timing inspection cap on counterweight cover. Connect the timing tester between ground and inner (far side) contact point. Use of the **tester (Tool No. 09900-27002)** is assumed here. **(Fig. 16-11)**

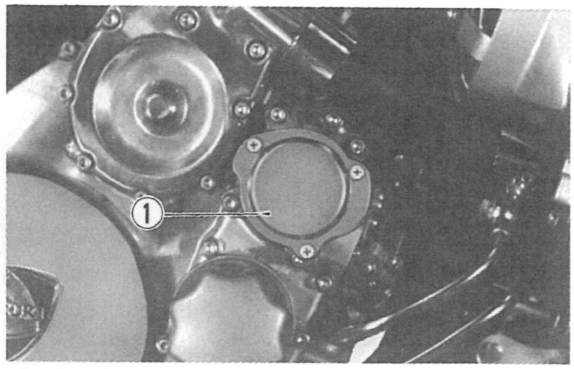


Fig. 16–8 1. Contact breaker assembly

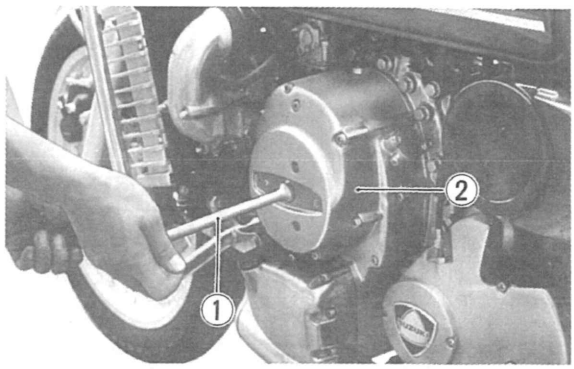


Fig. 16–9 1. 17-mm "T" type wrench
2. Generator cover

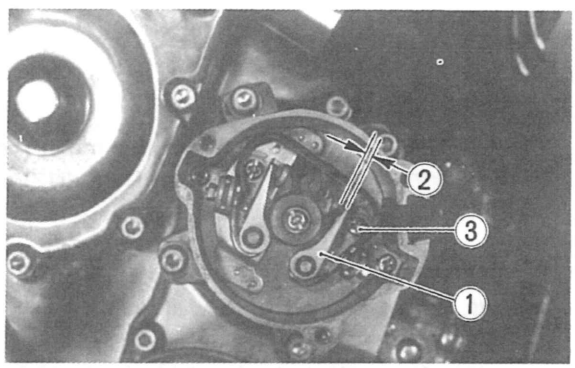


Fig. 16–10 1. Contact breaker point
2. Contact breaker point gap
3. Contact point fixing screw

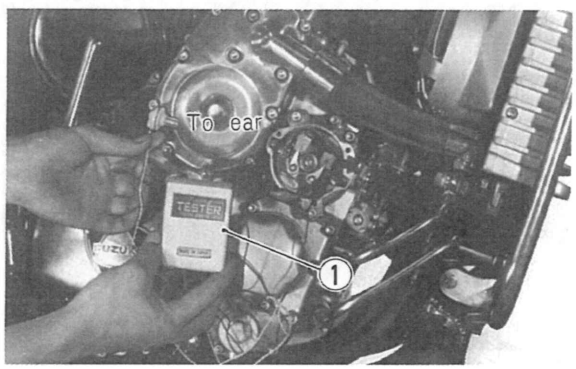


Fig. 16–11 1. Timing tester

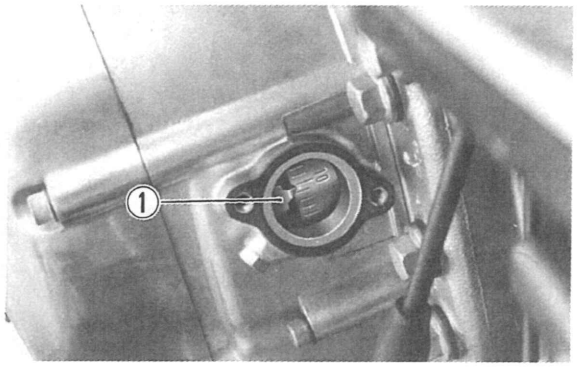


Fig. 16–12 1. Timing indicator

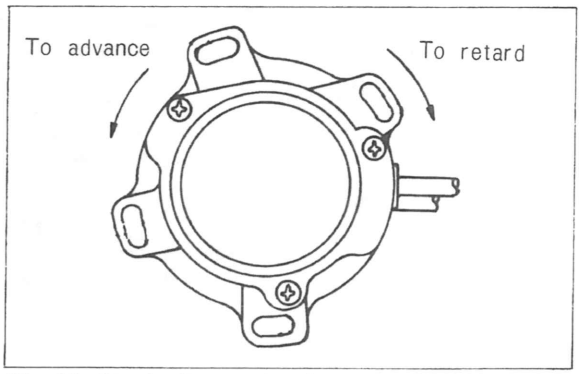


Fig. 16–13 1. Contact breaker assembly

Turn eccentric shaft ccw until the timing tester stops giving the peeping sound. Read the angle on the left counterweight **(Fig. 16-12)**.

This reading is the ignition timing (in terms of angular value referring to Top Dead Center). It should be **−10° B.T.D.C**; if not, eliminate the difference by angularly displacing the contact breaker assembly in place. The method is as follows:

Referring to **Fig. 16-13**, loosen the 4 Allen-head bolts securing the breaker assembly to clutch cover, and turn the assembly cw (clockwise) to **retard** or ccw to **advance** the timing toward the specification (−10° B.T.D.C.). After verifying that the tester stops "peeping" at this angular position noted on the counterweight, secure the breaker assembly by tightening the Allen-head bolts to **80** to **90 kg-cm (6.0~6.6 ft-lb)**. This tightening could disturb the timing, so check once again by turning eccentric shaft.

6. Check timing advance

This check is for finding out how much the ignition timing advances with rising speed of the engine, and is carried out with the use of the **SUZUKI Electrotester (Tool No. 09900-28103)**, a strobo device adapted to this type of checking.

(1) Remove the generator inspection cap, and take off the rubber plug. Use one of the cap securing screws to install a piece of wire (which is to serve as a pointer) as shown in **Fig. 16-14.**

Start up the engine and steady its speed at an idling speed of 1200 rpm. Direct the strobe light onto the hole now vacated by the rubber plug. Select a long engraved line, which is stroboscopically visualized now, and index the tip of the wire to this line; you have selected a reference angular position.

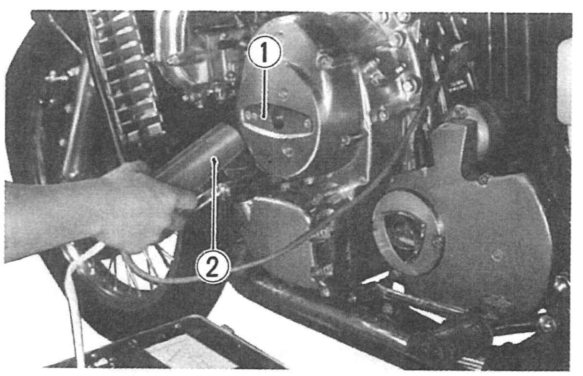


Fig. 16–14 1. Wire 2. Strobo

Raise the engine speed gradually all the way to upwards of 5000 rpm and, during this rise, see if the position indexed to by the wire starts advancing at about **1400 rpm** and if the wire tip comes to a halfway point between the two short engraved lines when the level of **5000 rpm** is reached. If these two things occur, with no further advance for speeds above 5000 rpm, it means that the advance mechanism is working correctly; if not, or if no advance occurs at all, the mechanism must be repaired. For the repair method, refer to the information given in **page 73.**

7. Service metering oil pump

(1) Remove the metering oil pump cover. Check to be sure that, when the throttle grip is twisted into full-throttle position, the mark on oil pump control lever is in line with the mark on oil pump body. If the two marks are off and apart, bring them into alignment by loosening the lock nut and turning the cable adjuster. **(Fig. 16-15)**

(2) Using the **engine oil measuring cylinder (Tool No. 09900-21602)**, check the rate of oil pump discharge. **(Fig. 16-16)**

The method is as follows: Detach the left-side frame cover, pull out the oil hose from the metering oil tank, plug up the tank oil outlet, fit the adaptor to the open end of the pulled out hose, and add some engine oil to the cylinder so that the oil surface inside will come up to the top end of the graduated scale.

(3) Start up the engine and, by referring to the tachometer indication, raise the speed to **2000 rpm.** Running in or tightening the idle adjust screw on the carburetor will raise the speed. Hold the oil pump control lever in the **full-opening mark** position, which is identified by match marks; and, under this condition, see how much oil the pump discharges in **6 minutes. (Fig. 16-15)**

The amount of the 6-minute discharge should be **5.0±0.5 cc**; if not, the oil pump must be replaced.

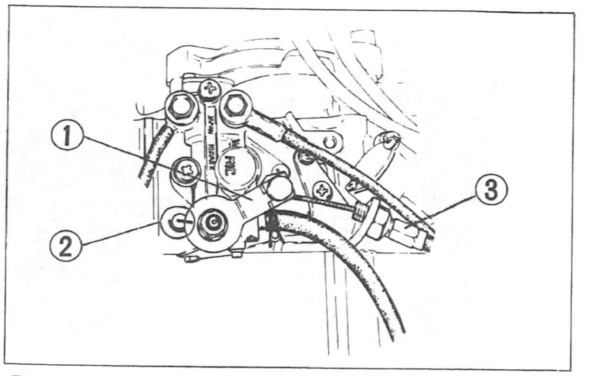


Fig. 16–15 1. Control lever 2. Aligning mark 3. Cable adjuster

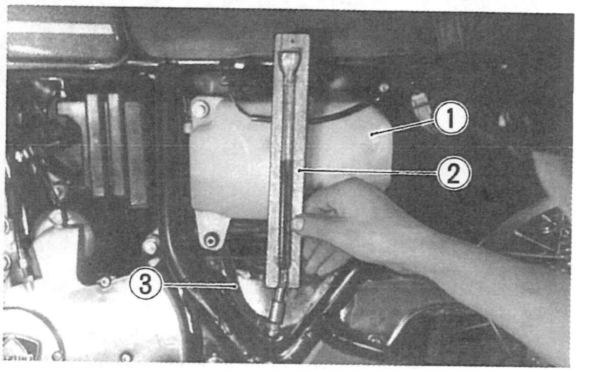


Fig. 16–16 1. Metering oil tank 2. Engine oil measuring cylinder 3. Oil hose

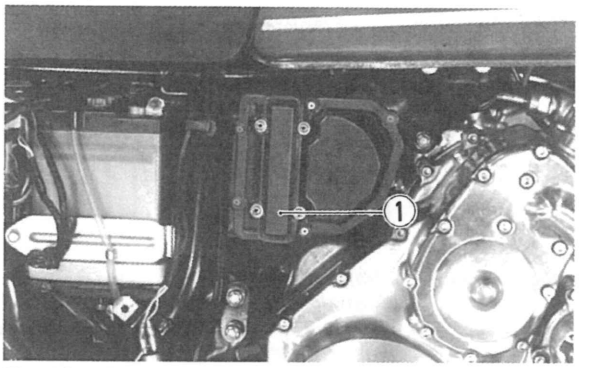


Fig. 16–17 1. Air cleaner right-hand cover

8. Wash air cleaner element.

(1) Remove the four screws securing the right-hand cover on the air cleaner, take of the cover, and remove the cleaner element **(Fig. 16-17)**. Separate the metal frame from the element by loosening the 4 screws. **(Fig. 16-18)**

(2) Wash the element (foam polyurethane) with a cleaning solvent, and squeeze off the solvent. Dip the element into a pool of SUZUKI CCI oil or an SAE No.30 motor oil, and squeeze the element lightly so that about **20** to **25 cc** of oil **(1 oz)** will remain in the foam polyurethane.

(3) Put on the metal frame, and restore the element to the cleaner case, inserting it with its small end foremost. **(Fig. 16-18)**

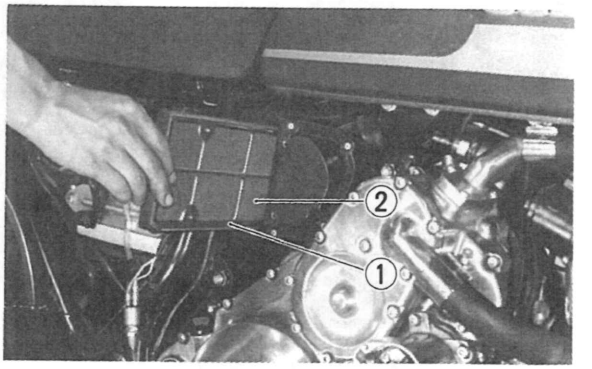


Fig. 16–18 1. Metal frame 2. Air cleaner element

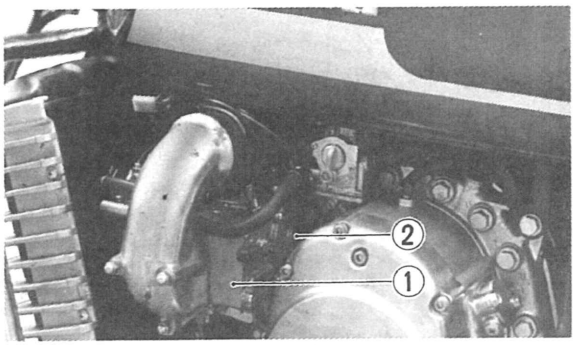


Fig. 16–19 1. Carburetor side cover
2. Rubber cap

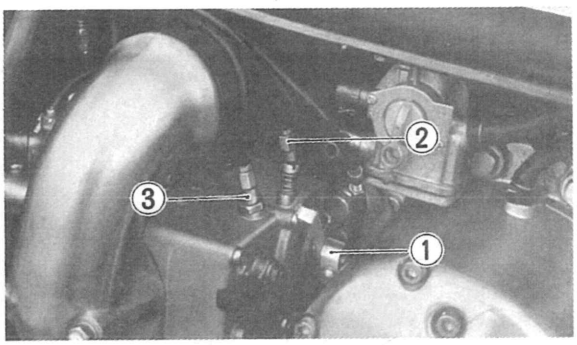


Fig. 16–20 1. Carb angle indicator "A"
2. Pull-side throttle cable adjuster
3. Return-side throttle cable adjuster

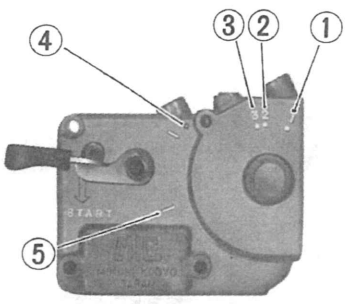


Fig. 16–21 1. Fully closed position
2. Fast idle opening position
3. Accelerating pump start-of-action point
4. Port valve lever touch point
5. Full-throttle position

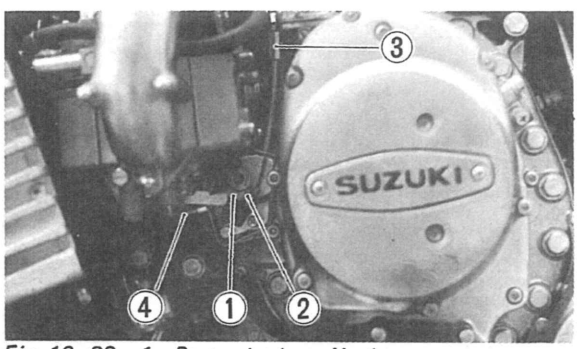


Fig. 16–22 1. Port valve lever No.1
2. Port valve lever No.2
3. Port valve cable adjuster (Pull-side)
4. Return-side port valve cable

9. Adjust engine idle speed

This adjustment is effected by means of the throttle cable and the idle adjust screw on the carburetor. The procedure for the throttle cable will be delineated first:

Throttle cable adjustment:

(1) Remove the rubber cap on the carburetor side cover. **(Fig. 16-19)**

(2) Install the **carburetor angle indicator "A" (Tool No. 09913-13710)** in this hole and secure it by tightening the screw. As shown in **Fig. 16-20**, the indicator is bifurcated into two arms, with the tip of each arm notched.

(3) Check to be sure that, when the throttle grip is twisted to full-throttle position, the tip of the long arm of the indicator points to the mark ⑤ **(Fig. 16-21)**. If the long arm is not up this mark, bring it to this mark by tightening the pull-side cable adjuster.

(4) From the fully closed position, twist the throttle grip slowly toward full-throttle position until port valve lever No.1 touches port valve lever No.2, and read the angle right there. The long arm of the indicator should be pointing to the mark ④; if not, bring it to this mark by turning the pull-side port valve cable adjuster **(Fig. 16-22)**.

(5) Give a push with a finger tip to the return-side cable inside the port valve case to see if a sag of **2** to **3 mm (0.08~0.12 in.)** occurs in this cable; if not, adjust the cable by means of the return-side port valve cable adjuster to produce this much sag. **(Fig. 16-22)**

(6) Adjust the return-side throttle valve cable to meet this requirement: When the choke lever is moved into "ON" position, the throttle grip will not turn due to this lever movement. Minimize the play of the return-side cable by means of the adjuster **(Fig. 16-20)**, making sure that the above requirement is fully satisfied.

(7) Adjust the play of the pull-side throttle cable to anywhere between **1** and **1.5 mm (0.04 ~ 0.08 in.)** by using the adjuster located below the throttle grip. **(Fig. 16-23)**

(8) Adjust the position of oil pump control lever as outlined in **page 151.**

Adjustment by idle adjust screw:

After a 5 minutes of warm-up run, tighten or loosen the idle adjust screw on the carburetor

side cover, while referring to the tachometer indication, to set the idle speed at **1200 rpm.** **(Fig. 16-20)**

10. Overhaul carburetor

Overhaul the carburetor as outlined in **6-2, page 65** to **66**. Be sure to have the following parts thoroughly cleaned and dried with compressed air before reassembling the carburetor:

Primary pilot air jet, secondary pilot jet and all other jets, fuel strainer, air inlet filter, primary pilot outlet and float valve seat.

11. Lubricate throttle cables

Inject motor oil with the oiler into the cable sheath while moving the inner cable up and down, as shown in **Fig. 16-24**. Use an **SAE No. 30 motor oil.**

12. Grease throttle grip

Loosen the two screws securing the right handle switch box, and separate the switch box into two halves. Apply a liberal amount of grease to the switch box. **(Fig. 16-25)**

13. Adjust clutch

(1) Start the engine. Pull in the clutch lever and shift into low gear. Check to see that the engine does not stall and that the motorcycle does not start creeping. Gradually release the clutch lever and open the throttle; then check to see that the machine starts off smoothly and picks up speed without showing any sign of clutch slippage. The clutch must be adjusted if these results of clutch lever manipulation are unsatisfactory. The adjusting procedure follows:

(2) Clutch adjustment

1) Detach the clutch release inspection cap from the engine sprocket cover. Run in the clutch cable adjuster as far as it will go into the engine sprocket cover, thereby loosening the clutch cable. **(Fig. 16-26)**
2) Loosen the lock nut on clutch release adjusting screw, turn the screw clockwise until the screw begins to offer a sharp resistance to turning. From this position, turn the screw back about **a quarter (1/4)** to **a half (1/2)** rotation and lock it there by tightening the lock nut. **(Fig. 16-26)**

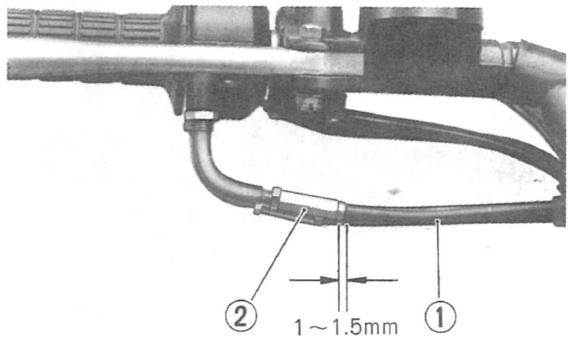


Fig. 16–23 1. Pull-side throttle cable
2. Cable adjuster

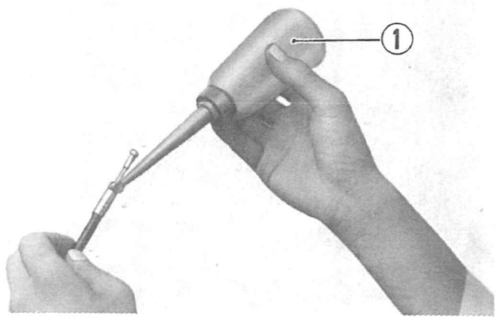


Fig. 16–24 1. Oiler

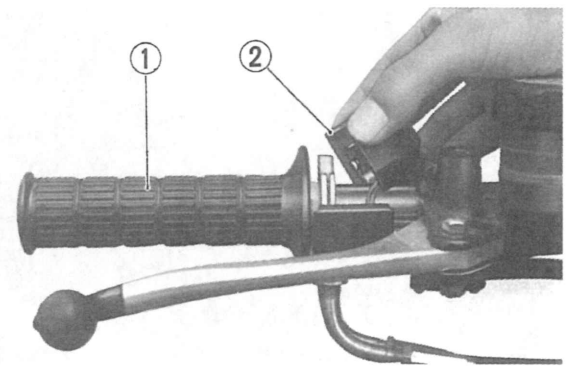


Fig. 16–25 1. Throttle grip
2. Right handle switch box

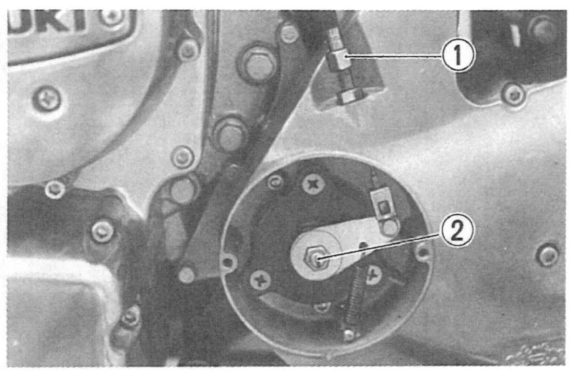


Fig. 16–26 1. Clutch cable adjuster
2. Clutch release adjusting screw

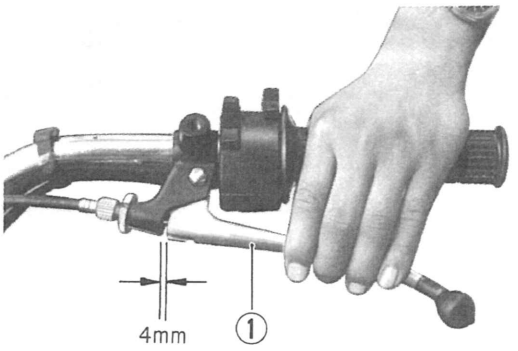


Fig. 16–27 1. Clutch lever

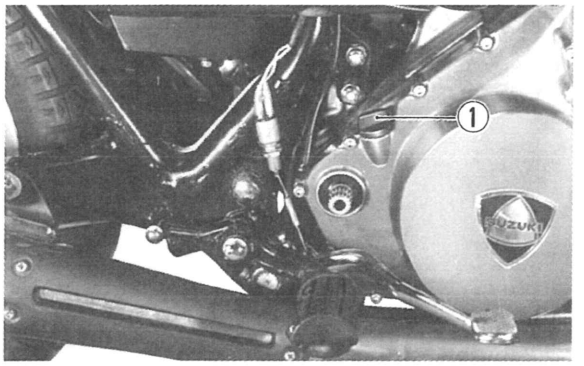


Fig. 16–28 1. Transmission oil filler

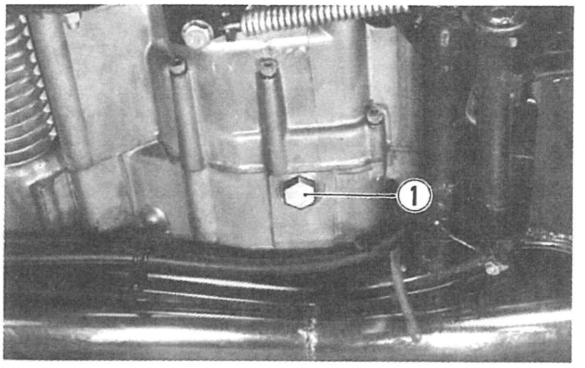


Fig. 16–29 1. Transmission oil drain plng

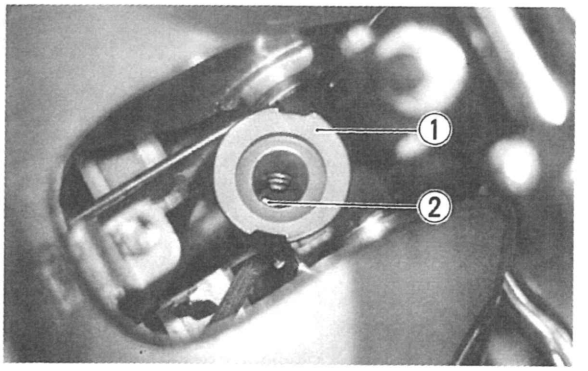


Fig. 16–30 1. Radiator filler
2. Level plate

3) Run out the clutch cable adjuster until the play of the clutch lever, shown in **Fig. 16-27**, becomes **4 mm (0.16 in.)**.

14. Change transmission oil

(1) Take off the transmission oil filler. Remove the drain plug on the bottom of the main case. **(Figs. 16-28** and **16-29)**

(2) Fill in **1600 cc (3.38/2.84 US/Imp. pt.)** of SUZUKI transmission oil or an **SAE 20W/40** multigrade motor oil.

15. Service engine coolant

How to service the coolant will be explained in three parts: the first part is for the attention to be given after the initial **1000 km** and every **3000 km** thereafter, the second part covers the special care needed for the engine before **a freezing weather sets in**, and the third part is for the **every-two-year** attention.

(1) Remove radiator cap. Look into the filler to see if the coolant surface is up and visible. This check should be carried out when the coolant temperature is down, preferably when it is at atmospheric temperature. Add distilled water to make the coolant surface up and visible in the filler. **(Fig. 16-30)**

Note: Use of distilled water is insisted, in order to protect the water jacket metal (which is an aluminum alloy) against corrosion and to ward off scale formation in the paths of coolant. Water of drinking quality is usually good enough as cooling water but there is no insurance in such water that it contain no high concentrations of impurities that are permissible for drinking but are not acceptable to this engine. Insist on distilled water. The engine of the RE5 deserves it.

Inspect the tell-tale hole under the water pump to see if any liquid (water or oil) is dripping from this hole in the clutch cover. If so, then the water pump must be repaired, the procedure of which is outlined in **4-4. WATER PUMP, pages 37** to **39. (Fig. 16-31)**

(2) Just before the freezing weather sets in, replace the existing cooling water by an anti-freeze coolant (mixture of water and ANTI-FREEZE compound). If such a coolant is

already in the cooling system, then the concentration of ANTI-FREEZE compound in it must be determined and, probably, an additional amount of the compound must be added to the existing coolant in order to produce a new concentration that will keep the coolant freeze-free throughout the cold season.

How to find out the ANTI-FREEZE compound concentration will be explained:

1) Sample out the existing coolant from the radiator. Measure the specific gravity of the sample, using a hydrometer as shown in **Fig. 16-32.**
2) Refer the S.G. reading just taken to **Table 1,** below, to find out the concentration.

To determine the amount of ANTI-FREEZE compound to be added to the existing coolant:

1) In **Table 2,** below, find out the quantity of ANTI-FREEZE compound needed to produce that concentration, in 4.5 litres of water (cooling system capacity), that will keep the 4.5-litre coolant freeze-free at the **lowest** freezing temperature expected.

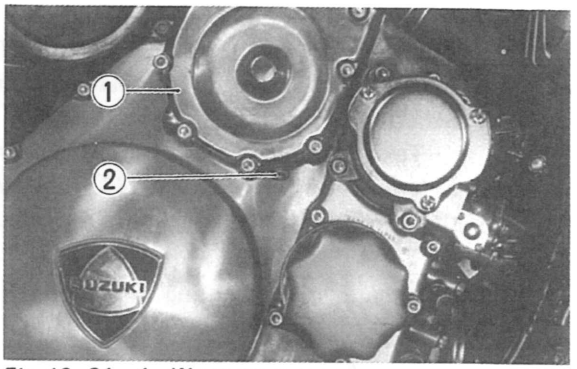


Fig. 16–31 1. Water pump case
2. Tell-tale hole for seals

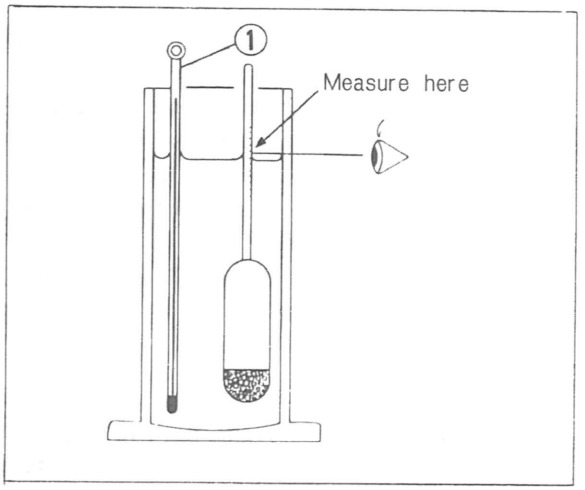


Fig. 16–32 1. Thermometer

2) You now have two concentration values. Compute the difference, which corresponds to the additional ANTI-FREEZE compound needed for the existing coolant.

Table 1

Percent concentration	Temperature at which coolant S.G. is measured °C (°F)											Freezing temp. °C (°F)
	10(50)	15(59)	20(68)	25(77)	30(86)	35(75)	40(104)	45(114)	50(122)	55(131)	60(140)	
	Specific gravity											
10%	1.017	1.016	1.014	1.013	0.012	1.010	1.008	1.006	1.004	1.001	0.999	-4 (25)
15%	1.025	1.023	1.022	1.020	1.018	1.016	1.014	1.012	1.010	1.008	1.005	-6 (21)
20%	1.032	1.031	1.029	1.027	1.025	1.023	1.021	1.019	1.016	1.014	1.011	-9 (16)
25%	1.040	1.038	1.036	1.034	1.032	1.030	1.028	1.025	1.023	1.020	1.017	-12(10)
30%	1.047	1.045	1.043	1.041	1.039	1.037	1.034	1.032	1.029	1.026	1.023	-16 (3)
35%	1.055	1.053	1.051	1.049	1.046	1.043	1.041	1.038	1.035	1.032	1.029	-21 (-6)
40%	1.063	1.060	1.058	1.055	1.053	1.050	1.048	1.045	1.042	1.038	1.035	-25 (-13)
45%	1.070	1.068	1.066	1.063	1.060	1.057	1.054	1.051	1.048	1.045	1.041	-31 (-24)
50%	1.078	1.072	1.072	1.069	1.067	1.064	1.061	1.058	1.055	1.051	1.047	-37 (-35)
55%	1.083	1.080	1.078	1.075	1.072	1·069	1.066	1.063	1.059	1.056	1.053	-45 (-49)

Table 2. GOLDEN CRUISER #1200 needed for 4.5 litres (4.75/3.95 US/Imp qt.)

Coolant freezing point °C (°F)	−4 (25)	−6 (21)	−9 (16)	−12 (10)	−16 (3)	−21 (−6)	−25 (−13)	−31 (−24)	−37 (−35)	−45 (−49)
Quantity of GOLDEN CRUISER #1200 needed litres (US/Imp qt)	0.45 (0.47/ 0.39)	0.68 (0.71/ 0.60)	0.90 (0.95/ 0.79)	1.13 (1.69/ (0.99)	1.35 (1.40/ 1.20)	1.60 (1.70/ 1.40)	1.80 (1.90/ 1.55)	2.00 (2.10/ 1.75)	2.25 (2.40/ 2.00)	2.50 (2.60/ 2.20)
Concentration (%)	10	15	20	25	30	35	40	45	50	55

Notes: ANTI-FREEZE compound is here assumed to be GOLDEN CRUISER No. 1200 which is available from SUZUKI.

Take the target concentration for a temperature level 5° to 10°C below the lowest freezing temperature expected.

The formula for computing the amount of the needed addition is:

$$X = B - \frac{A}{100}(4.5 - X),$$

where X = additional amount of GOLDEN CRUISEN needed, litres
B = quantity of GOLDEN CRUISER needed to make the coolant freeze-free down to a certain temperature level, litres
A = GOLDEN CRUISER concentration in % in the existing coolant

The amount of X having been found, drain out the same amount from the cooling system. After adding X litres of the compound or replacing the existing coolant by a new mixture of distilled water and GOLDEN CRUISER, start up and the engine and run it until the indicating hand of the thermometer comes to the middle point of the scale or to about 88°C.

(3) At intervals of two years, change the coolant and, at the same time, flush the cooling system clean. For the replacement coolant, use of an anti-freeze coolant is recommendable but distilled water may be used instead. In either case, add the sealer compound **(SUZUKI 7 on Bar's Leaks).**

The flushing procedure is as follows:

1) Remove the two mufflers. Remove the exhaust manifold. This empties the system.
2) Take off the radiator cap. Remove the drain plugs, one on the radiator and one on the engine. **(Figs. 16-33, 34)**
3) Restore the drain plugs, re-install the manifold and mufflers. Fill up the system with clean water of drinking quality.
4) Run the engine to circulate the water. Keep on running it until the water temperature reaches the normal operating level.
5) Drain out the water. The water will look dirty. Repeat the steps **1)** through **4)** a number of times until the water drained out after flushing circulation is noted clean and colorless.
6) Drain the system completely, and restore the drain plugs, exhaust manifold and mufflers.
7) Fill up the system with a properly prepared anti-freeze coolant, and a proper amount of SUZUKI 7 on Bar's Leaks. Run the engine to bring the coolant temperature to the normal operating level. Finally, check the coolant level at the radiator filler and add distilled water—when the engine has cooled off.

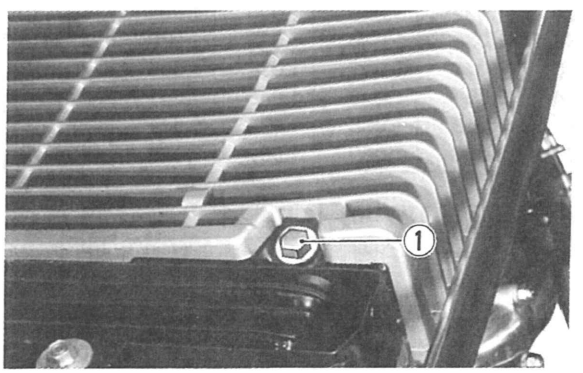


Fig. 16–33 1. Radiator drain plug

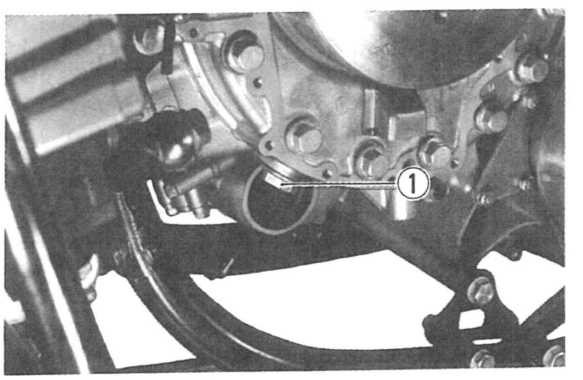


Fig. 16–34 1. Water drain plug

16. Service the battery

(1) Remove the right frame cover. This exposes the battery in position. If the electrolyte surface is down, add distilled water to raise it to the upper level mark in each cell. **(Fig. 16-35)**

(2) Check the electrolyte in each cell for S.G. specific gravity in order to tell the state of charge is given in **11-2, page 104.** Recharge the battery off the machine if it is found to be in run-down or near-run-down state. **(Fig. 16-36)**

Caution: Never attempt to recharge the battery in place from an external recharger.

(3) Inspect the positive and negative terminal posts, rubber cap, vent tubes, rubber band, etc., for cleanliness and signs of deterioration. Some defective conditions are serious and the only remedy is to replace the battery.

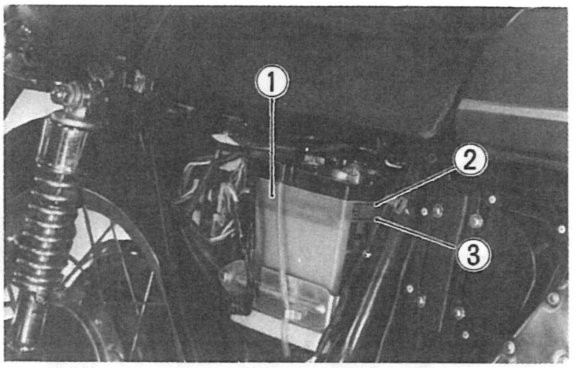


Fig. 16–35 1. Battery 2. Upper level mark 3. Lower level mark

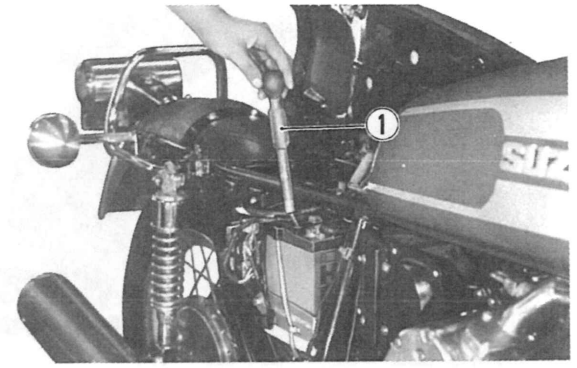


Fig. 16–36 1. Hydrometer

17. Service fuel system

(1) Inspect the various parts of the fuel system for evidence of leakage.

(2) Fuel hoses are semi-permanent parts, but the user is advised to replace them regularly at intervals of **2 years** to ensure the perfect safety or whenever some event takes place during the service of the motorcycle to lay a reasonable ground for suspecting their integrity.

18. Check steering stem play

The steering stem is required to have no axial play in the head pipe. If any rattle is noted on the stem, eliminate it by tightening the stem nut. The torque specification for this nut is stated in **12-2, page 110.**

Check the stem for rattle with the motorcycle kept erect on its center stand. **(Fig. 16-37)**

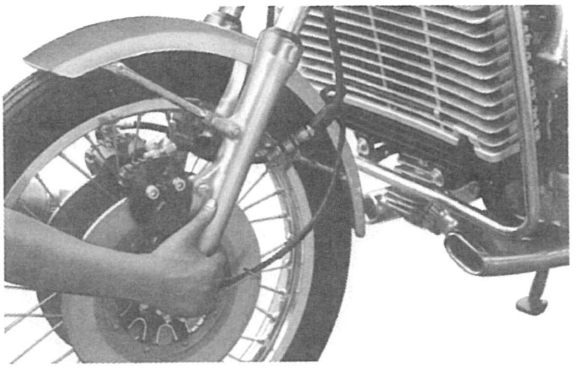


Fig. 16–37

19. Change front fork oil

(1) Unscrew the front fork drain plug (at the bottom of the fork outer tube) to drain out the oil. To eject the oil, the forks must be shaken in a pumping fashion. **(Fig. 16-38)**

Be sure to restore the drain plug after all the oil has been removed.

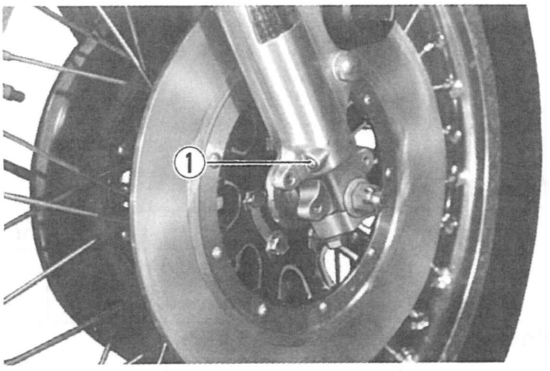


Fig. 16–38 1. Drain plug

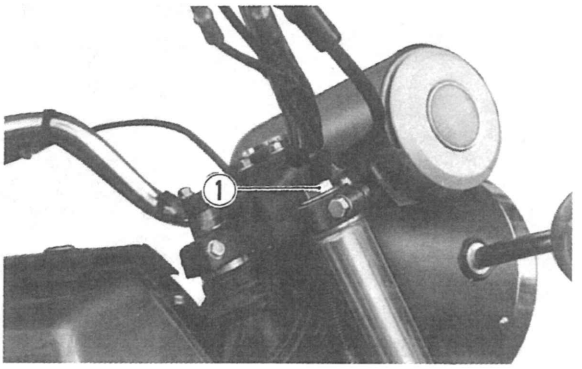


Fig. 16–39 1. Filler plug

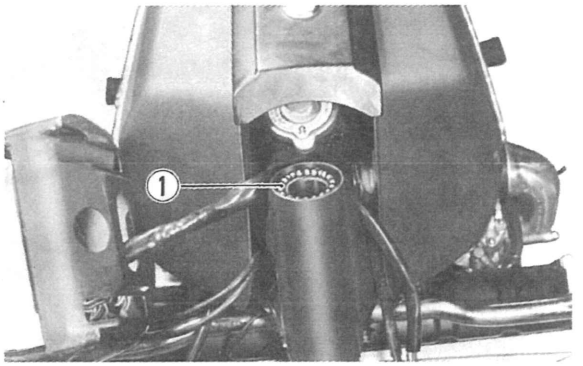


Fig. 16–40 1. Steel balls

(2) Fill in the fresh oil through the fork oil filler (which is normally kept closed with a plug).

For each fork, **150 cc (5.3/5.1 US/Imp oz.)** of oil is needed. Use a premium-quality **SAE 10W/30** motor oil or **A.T.F.** (Automatic Transmission Fluid). Be sure to tighten the filler plug securely after filling. **(Fig. 16-39)**

20. Grease steering head bearings

To service the thrust ball bearings, the steering stem section of the front suspension must be disassembled. The disassembling procedure is set forth in **12-2, page 110.**

Clean each bearing, removing the existing grease, and apply a liberal amount of fiber grease to the reces and balls. **(Fig.16-40)**

21. Check tire air pressure and tread wear

Tire pressure has a lot to do with economy, performance and, above all, safety. Lack of inflating pressure hastens tire wear, increases road resistance (which increases fuel consumption), and reduces the ability of the motorcycle for cruising performance. Smooth cornering is difficult with tires that are soft.

Over-inflated tires present a spot contact, instead of an area contact, with the ground to invite dangerous skidding on braking. Over-inflation unnecessarily stresses the tire to shorten its life.

The proper inflating pressure for the tires of the RE5 is indicated in **Table 3,** in kg/cm^2 and psi.

Worn-down tires reduce riding stability, and are in fact a menace not only to the rider but also to other traffic. How to tell a worn-down condition cannot be answered with quantititative precision. As a guideline, based on experienced, the following limit is recommended:

Replace the tire when the remaining depth of tire tread has decreased to **1.6 mm (0.06 in.)** for front or to **2.0 mm (0.08 in.)** for rear.

Table 3. Tire inflating pressure

	Front				Rear			
	Solo riding		Dual riding		Solo riding		Dual riding	
	kg/cm	psi	kg/cm	psi	kg/cm	psi	kg/cm	psi
Normal riding	1.75	25	1.75	25	2.0	28	2.25	32
Continuous high speed riding	2.0	28	2.0	28	2.25	32	2.5	36

22. Check front brake system.

(1) Replenish the brake fluid reservoir on the master cylinder if the fluid is not up to the upper level mark (embossed). **(Fig. 16-41)** Be sure to use one and the same brand of brake fluid. A high-grade brake fluid coming under one of the following classifications must be selected:

Classification or specification	Where
DOT 3 DOT 4	In U.S.A.
SAE J1703a SAE J1703b SAE J1703c	Elesewhere
SAE 70R3	Formerly SAE J70b

Note: **Each RE5 motorcycle is shipped from the factory with a glycol-base brake fluid (as distinguished from silicone-base or petroleum-derivative fluids). Do not allow the brake fluid in service to be mixed with any other kind or even brand of brake fluid, or some of the brake system parts may suffer damage. A brake fluid left standing in an opened or unsealed container is usually in deteriorated condition and should not be used in replenishing, not to mention of replacing the existing one. Do not wet painted surface with the brake fluid or the paint may come off. Instrument gauge lenses too are badly affected by this fluid.**

(2) Inspect the various parts of the brake system for leakage. Examine hose joints with particular care. A leaking point, if any, must be corrected by retightening, repairing or by replacing the parts involved.

(3) Check each friction pad for wear. The wear limit is indicated by an engraved red line on the circumference of each pad. If a pad is found worn down to the limit, replace all of the pads in the brake. **(Fig. 16-42)**

23. Change brake hoses

Brake hoses are meant to be replaced periodically, at intervals of 2 years. The reason is

Fig. 16–41 1. Reservoir 2. Upper level mark

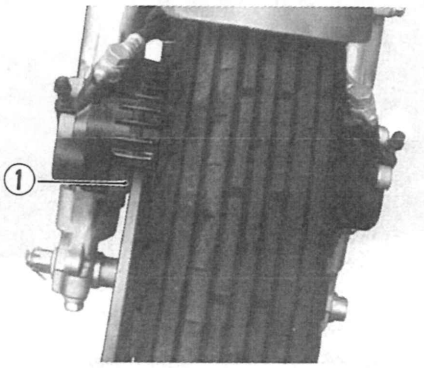


Fig. 16–42 1. Wear limit line

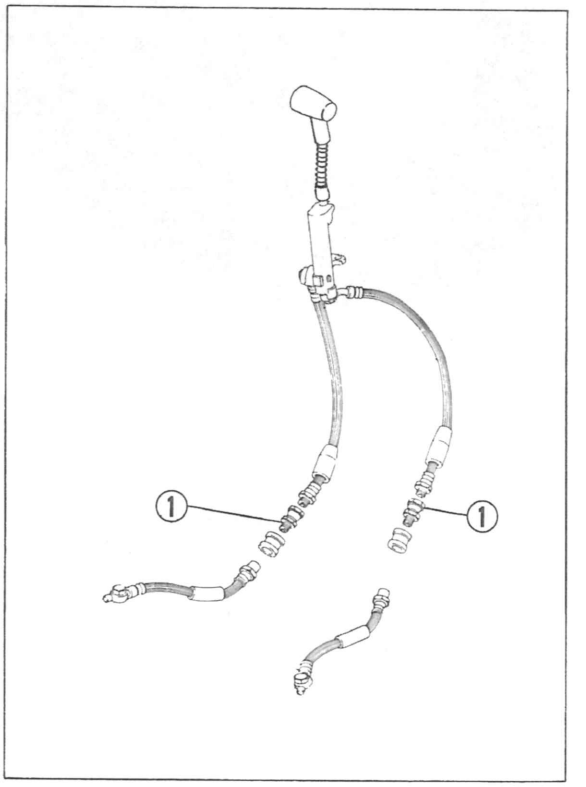


Fig. 16–43 1. Adaptor

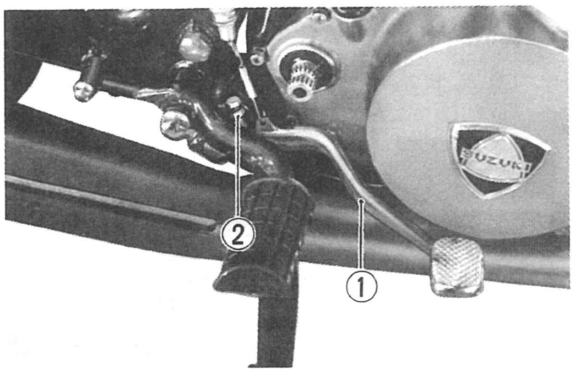


Fig. 16–44 1. Brake pedal
2. Brake pedal adjuster

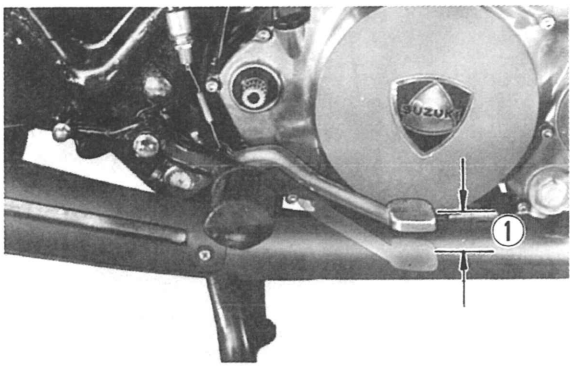


Fig. 16–45 1. Brake pedal travel

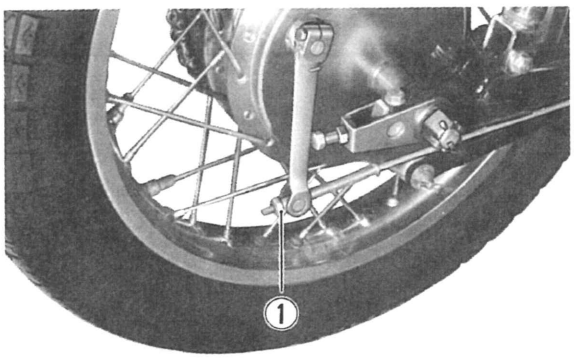


Fig. 16–46 1. Brake adjusting nut

the same as for the fuel hoses. After replacing the brake hoses, check to be sure that each hose in place is free of any twist. A twist, if found, can be eliminated by means of the adaptor (located between two adjacent hoses).

The work of changing the brake hoses is completed by bleeding air out of the brake lines. The method is described in **14-2, page 133.**

24. Check rear brake system

(1) Adjust the brake pedal as follows:

1) Set the adjuster as shown in Fig. **16-44.** The purpose is to set the home position of the brake pedal properly.
2) See if the brake pedal travel is anywhere between **20** and **30 mm (0.8 ~ 1.2 in.),** as shown in **Fig. 16-45.** If not, set it to anywhere within this range by means of the rear brake adjusting nut, shown in **Fig. 16-46.**

(2) The rear brake is equipped with a lining wear limit indicator, as shown in Fig. **16-47.** The indicator has a range mark (line) embossed on it, and the brake cam shaft carries an index mark. As long as the extension of this index line is within the range mark **when the brake pedal is depressed,** the brake lining still has some stock to wear and need not be replaced.

To check the lining for wear by referring to the limit indicator, proceed as follows:

1) First, make sure that the rear brake system is properly adjusted.
2) Using a small rule, see where the extension of the index line lies.
3) If the extension line falls outside of the marked range, as shown in **Fig. 16-48,** replace the brake shoes.

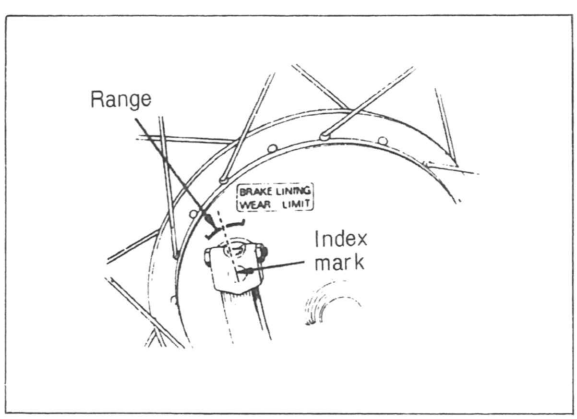


Fig. 16–47

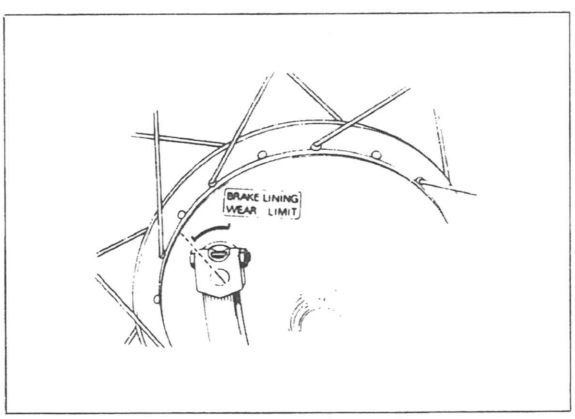


Fig. 16–48

25. Grease rear brake pedal and cam shaft

(1) Remove the rear brake pedal and apply a liberal amount of grease to the journal portion of the brake rod arm. See **Fig. 16-49.**

(2) Disassemble the rear brake panel as outlined in **13-3, page 123,** , and apply grease to the journal portion of the cam shaft. Give a thin coat of grease. **Fig. 16-50** shows the portion to receive grease.

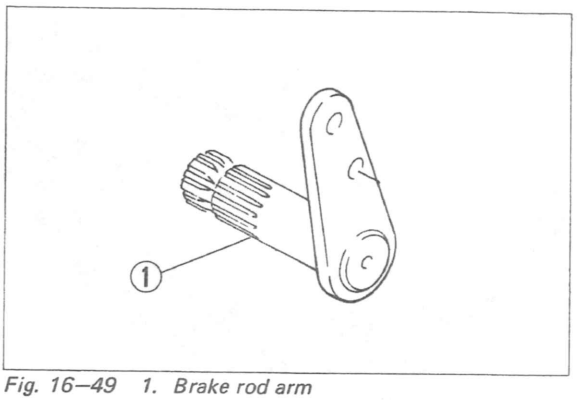


Fig. 16–49 1. Brake rod arm

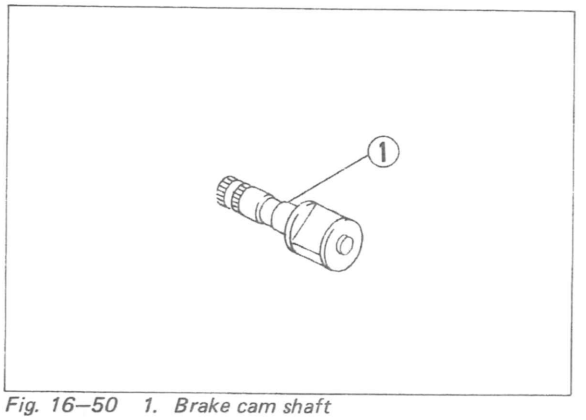


Fig. 16–50 1. Brake cam shaft

26. Adjust wheel alignment

The rear wheel can be displaced angularly around its axle as seen in the plan view. Wheel alignment is to be adjusted by taking advantage of this feature.

To check the alignment, proceed as follows (by referring to **Fig. 16-51**):

Put a straightedge against the rear wheel, as shown, and parallel the front wheel to the straightedge. Measure the clearance "A". Bring the straightedge to the other side and similarly measure the clearance "B". These two clearances "A" and "B" must be equal. If they are not, as in the case illustrated in **Fig. 16-51,** displace the rear wheel angularly in clockwise direction to equalize "A" and "B".

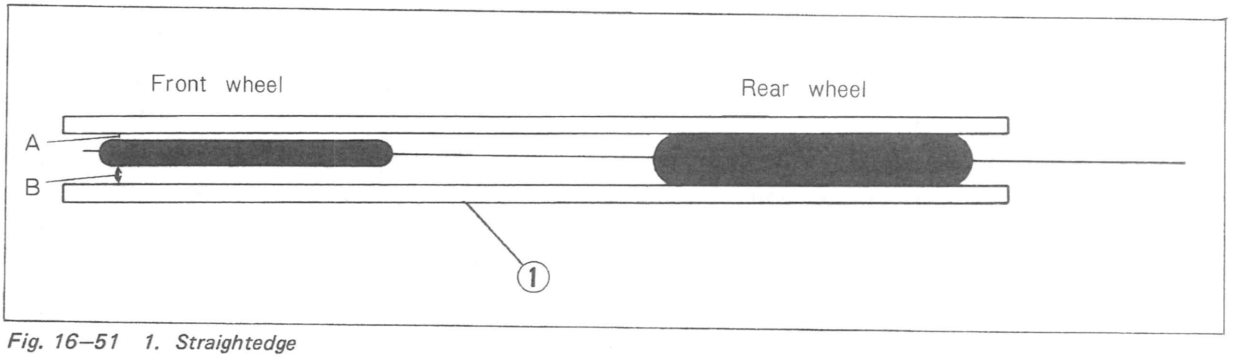


Fig. 16–51 1. Straightedge

27. Service final drive

(1) Check and adjust the slack of the drive chain, as follows:

1) Hold the motorcycle erect on its center stand. Move the chain up and down at its middle point and check the total deflection. This deflection should be between **15** and **20 mm (0.6~0.8 in.),** as shown in **Fig.16-52.**

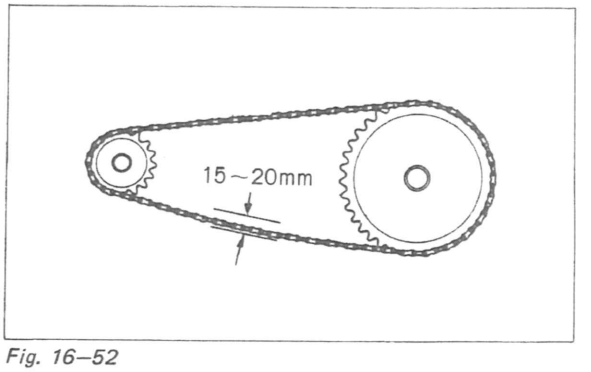


Fig. 16–52

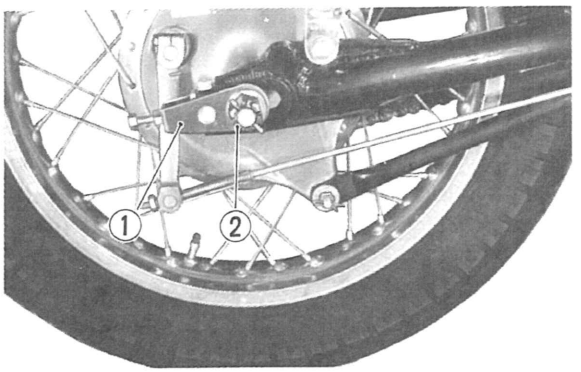


Fig. 16–53 1. Chain adjuster
2. Rear axle nut

2) If the deflection is greater or less than is specified, remove the axle nut cotter pin and loosen the nut; loosen the two lock nuts on drive chain adjusting nuts; and turn the two adjusting bolts equally to bring the chain deflection into the specified range.
3) Tighten the lock nuts and axle nut to a torque to **850** to **1150** kg-cm (**62 ~ 84** ft-lb). **(Fig. 16-53)**
4) Install a new cotter pin to lock the axle nut. Spin the rear wheel and re-check the chain slack.

(2) Check the drive chain stretch (permanent elongation) according to the method set forth in **13-4, page 124.**

(3) Inspect the drive and driven sprockets for wear, particularly for wear of sprocket teeth. Replace the sprockets as necessary.

28. Retighten bolts and nuts

Bolts and nuts in a motorcycle must be expected to become loose more or less in the long course of usage because of cruel shocks and vibrations to which the vehicles of this kind are subjected. Thus, it is highly desirable and, for some critical bolts and nuts, mandatory to check and retighten them from time to time.

Bolts and nuts, listed below, are keynotes for safety. They must be retightened to the torque values indicated. Never use ordinary wrenches; use torque wrenches in servicing the listed bolts and nuts:

Table 4. Tightening torque

Part	kg-cm	ft-lb
Front axle nut	360 ~ 520	26 ~ 38
Front axle holder nut	150 ~ 250	11 ~ 18
Handlebar clamp bolt	120 ~ 200	9 ~ 14
Front fork lower bracket bolt	200 ~ 300	14 ~ 22
Steering stem bolt	250 ~ 400	18 ~ 29
Front fork upper bracket bolt (R & L)	200 ~ 300	14 ~ 22
Front fork upper bracket rearbolt	150 ~ 250	11 ~ 18
Rear brake cam lever fitting nut	50 ~ 80	4 ~ 6
Rear swinging arm pivot shaft nut	500 ~ 750	36 ~ 54
Front footrest bolt	300 ~ 450	22 ~ 33
Rear torque link nut	200 ~ 300	14 ~ 18
Rear shock absorber nut	200 ~ 300	14 ~ 18
Rear axle nut	850 ~ 1150	62 ~ 84
Master cylinder fixing bolt	50 ~ 80	3.6 ~ 5.8
Brake hose union bolt	150 ~ 250	11 ~ 18
Brake hose adaptor	250 ~ 300	18 ~ 22
Brake disc bolt	150 ~ 250	11 ~ 18
Caliper fixing bolt	250 ~ 400	18 ~ 29
Caliper axle bolt	250 ~ 350	18 ~ 25
Caliper bleeder bolt	60 ~ 90	4.3 ~ 6.5

29. Check lamps, horn and instruments

(1) Check the headlamp for beam alignment and adjust it as necessary, according to the following procedure:

1) Turn the vertical adjusting screw to alter the beam direction vertically. The standard vertical alignment is such that the center of the beam hits the ground **50 meters (164 ft)** straight ahead when the motorcycle is in the normal riding attitude. **(Fig. 16-54)**

2) Turn the horizontal adjusting screw to alter the beam direction horizontally. Running in this screw deflects the beam toward the left (of the rider) and vice versa. Make this adjustment to point the beam straight ahead when the front wheel and handle bar are in the position for straightforward driving. **(Fig. 16-54)**

(2) Check the stop lamp switches for operation at the front brake lever and at the rear brake pedal, respectively.

1) Stop lamp should light up just when either the front brake or the rear brake begins to apply. In other words, each lamp switch must be so set that it will close the lighting circuit in response to the brake it serves. In the case of front stop lamp switch, the moment it closes relative the braking action can be set as desired by displacing the switch in place toward the right or left. Loosening its securing screw permits it to be so displaced.

(2) For similar adjustment on the rear stop lamp switch, loosen the lock nuts, top and bottom, and displace the switch in place vertically. **(Figs. 16-55, 56)**

(3) Check the turn signal lamps for operation. Repair or replacement of some parts is necessary when the lamps are noted to work erratically.

(4) Check the horn, speedometer, tachometer and others from the functional standpoint. Repair or replacement of parts involved is necessary if any malfunction is noted.

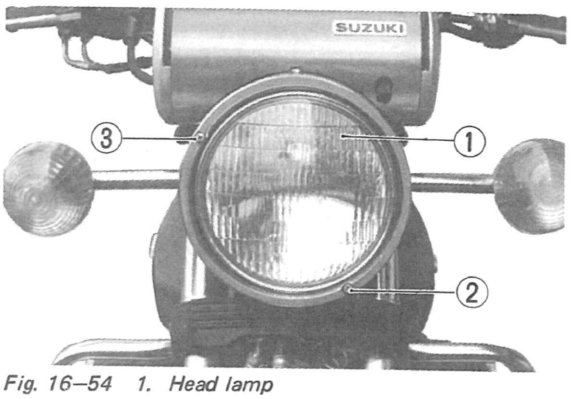


Fig. 16–54 1. Head lamp
2. Vertical adjusting screw
3. Horizontal adjusting screw

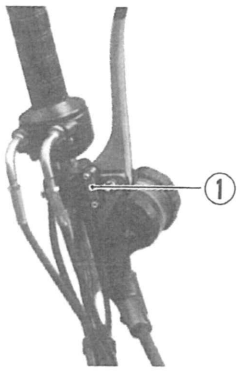


Fig. 16–55 1. Front stop lamp switch

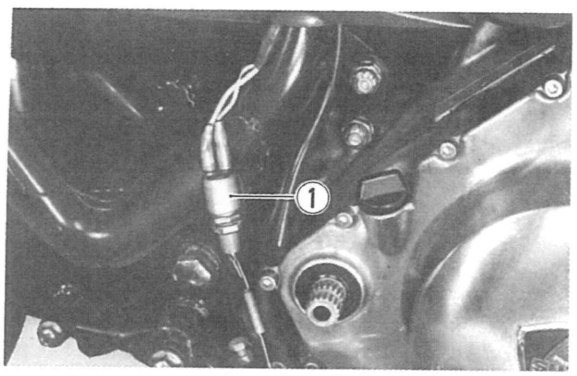


Fig. 16–56 1. Rear stop lamp switch

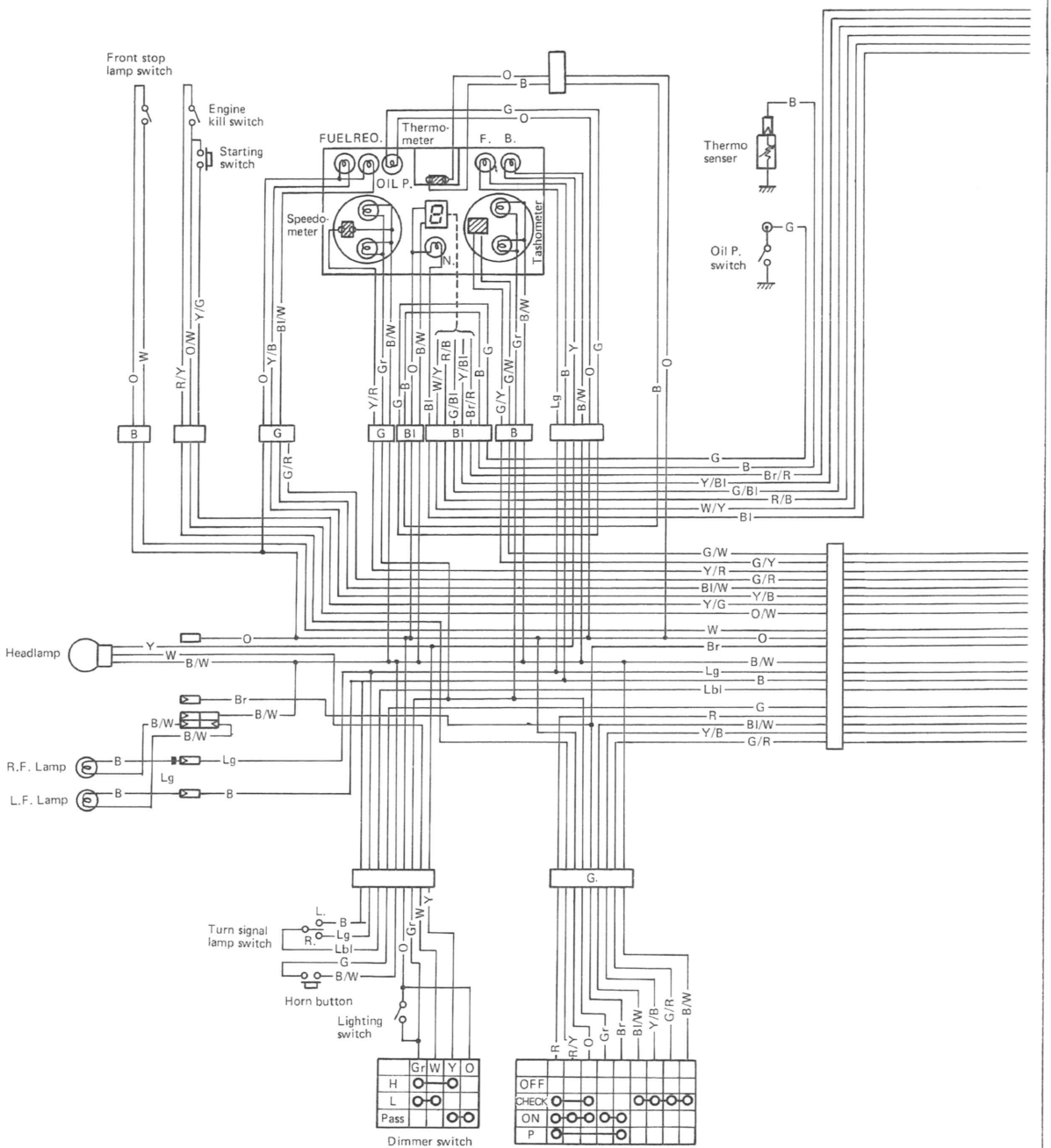
WIRING DIAGRAM

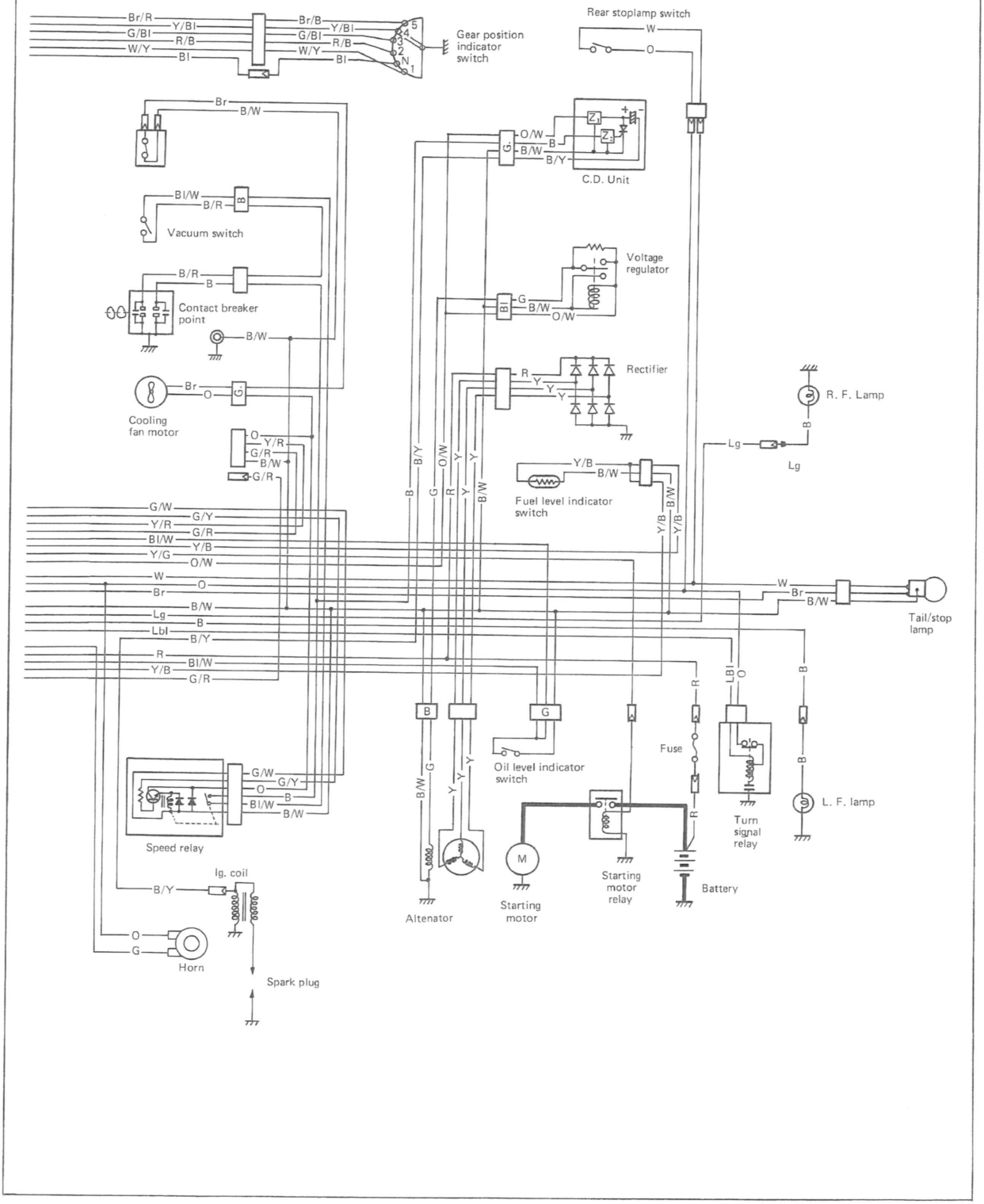
GROUP 17

COLOR CODE LIST

B	Black
Bl	Blue
Br	Brown
G	Green
Gr	Gray
Lbl	Light blue
Lg	Light green
O	Orange
R	Red
W	White
Y	Yellow

B/R	Black with Red tracer
B/W	Black with White tracer
B/Y	Black with Yellow tracer
Bl/W	Blue with White tracer
Br/R	Brown with Red tracer
G/Bl	Green with Blue tracer
G/R	Green with Red tracer
G/W	Green with White tracer
G/Y	Green with Yellow tracer
O/W	Orange with White tracer
R/B	Red with Black tracer
R/Y	Red with Yellow tracer
W/Y	White with Yellow
Y/B	Yellow with Black tracer
Y/Bl	Yellow with Blue tracer
Y/G	Yellow with Green tracer
Y/R	Yellow with Red tracer


Front stop lamp switch
Engine kill switch
Starting switch
FUELREO.
Thermo-meter
F. B.
OIL P.
Speedo-meter
Tashometer
Thermo senser
Oil P. switch
Headlamp
R.F. Lamp
L.F. Lamp
Turn signal lamp switch
Horn button
Lighting switch
Dimmer switch
OFF
CHECK
ON
P
H
L
Pass


Br/R
Y/Bl
G/Bl
R/B
W/Y
Bl
Br/B
Y/Bl
G/Bl
R/B
W/Y
Bl
5
4
3
2
N
1
Gear position indicator switch
Rear stoplamp switch
W
O
Br
B/W
Bl/W
B/R
Vacuum switch
B/R
B
Contact breaker point
B/W
Br
O
G
Cooling fan motor
O
Y/R
G/R
B/W
G/R
G/W
G/Y
Y/R
G/R
Bl/W
Y/B
Y/G
O/W
W
O
Br
B/W
Lg
B
Lbl
B/Y
R
Bl/W
Y/B
G/R
O/W
B
G
Bl
G
B/W
O/W
C.D. Unit
Voltage regulator
Rectifier
R
Y
Y
Y
B
B/Y
G
O/W
R
Y
Y
B/W
Y/B
B/W
Fuel level indicator switch
Y/B
B/W
R. F. Lamp
B
Lg
Lg
W
Br
B/W
Tail/stop lamp
B
G
Oil level indicator switch
B/W
G
Y
Y
Fuse
R
R
Lbl
O
B
B
L. F. lamp
Turn signal relay
G/W
G/Y
O
B
Bl/W
B/W
Speed relay
Ig. coil
B/Y
O
G
Horn
Spark plug
Alternator
M
Starting motor
Starting motor relay
Battery